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30% REMEDIAL DESIGN REPORT

**Industri-plex Operable Unit 2
(including Wells G&H Operable Unit 3) Superfund Site
Woburn, Massachusetts**

Prepared by:

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APRIL 2012

DRAFT

ATTACHMENT A3A

PDI-3A Groundwater Discharge to HBHA Pond

1. OBJECTIVES AND SCOPE

PDI-3A was conducted to better define the location and extent of the groundwater contaminant plume where it discharges into HBHA Pond. The specific objectives of PDI-3A were to: 1) delineate the horizontal extent of the contaminated groundwater plume discharging into the Pond above surface water cleanup standards for site COCs, and 2) to define the location of the cofferdam(s) for the purpose of containing the COCs within the Pond.

Details regarding the scope of work for PDI-3A were provided on pages 11 to 13 of the FSP dated 25 March 2011. The scope of work was implemented in three phases, as follows:

- Phase I - Shoreline Groundwater Profiling: Phase I consisted of groundwater profiling at thirteen locations along the eastern and western shoreline of the HBHA Pond.
- Phase II - Groundwater Sampling in HBHA Pond: Phase II involved the installation and sampling of nine temporary drive point piezometers along the centerline of HBHA Pond. Based on the groundwater analytical results, four piezometers were re-installed to remain in place for up to one year to evaluate gradients between the groundwater and surface water along the centerline of HBHA Pond.
- Phase III - Installation of Monitoring Wells: Phase III involved the installation of seven monitoring well pairs along the eastern shore, western shore, and northern portions of the HBHA Pond to evaluate seasonal fluctuations in groundwater discharge and determine vertical gradients.

2. IMPLEMENTATION SUMMARY

Installation of temporary and permanent monitoring locations is described in Section 2.1; sample collection methods are described in Section 2.2. All PDI-3A locations were captured with GPS following completion and all land sampling and monitoring well locations were surveyed by a Professional Land Surveyor.

2.1 Installation

Phase I - Shoreline Groundwater Profiling

Phase I explorations consisted of groundwater profiling in north-south transects along the eastern and western shoreline of the Pond extending south of the known limits of contamination (Figure A3A-1). Thirteen groundwater profiling locations were completed as part of Phase I. Six of the profiling locations (DP-1 through DP-6) along the eastern shoreline of HBHA Pond were completed in March 2009. This work was completed prior to the RDWP approval, but was conducted consistent with the scope described in the EPA-approved letter dated 13 August 2008 from de maximis.

The remaining seven profiling locations (PF-001 through PF-007) were completed between April 2011 and July 2011. Groundwater Profiling was conducted in a manner consistent with the FSP, as described below. Exploration locations are shown on Figure A3A-1.

- Prior to drilling activities, the seven groundwater profiling locations located along the western shoreline of HBHA Pond were vacuum excavated to depths ranging from 7 to 10 feet (ft) below

ground surface (bgs) due to the presence of utilities in the area. Cobbles, bricks or other obstructions encountered were removed and the excavated soil was placed back in the excavation.

- At locations where the current water table depth could not be confirmed (i.e., by previous explorations, existing monitoring wells, or inferred from nearby surface water features), a 1 7/8 in. ID Geoprobe® soil sampling sleeve was advanced to confirm the depth of groundwater (as observed in the soil samples) prior to the advancement of the stainless steel sampling point.
- Using a Geoprobe® 6610 DT rubber-track mounted rig, the drilling contractor advanced stainless steel sampling points to three depth intervals at each sampling location:
 - 1) At the water table, which varied from 7 to 16 ft bgs,
 - 2) Near the bottom depth of the HBHA Pond which varied from 17 to 26 ft bgs, and
 - 3) At a deeper overburden location which varied from 27 to 36 ft bgs.

Refusal was not encountered at any of the sampling locations.

- After the drilling contractor advanced the stainless steel sampling points to the desired depth interval, the tooling was pulled back to expose a 4.0 ft length of stainless steel screen from which groundwater samples were collected.
- Boreholes were grouted to the surface upon completion.

Phase II - In-Pond Groundwater Sampling

Nine temporary piezometers (PZ-001 through PZ-009) were installed between May and July 2011 along the centerline of HBHA Pond as shown on Figure A3A-1. These temporary piezometers were sampled immediately following installation. Four semi-permanent piezometers were subsequently installed in September and November 2011 for longer-term monitoring of gradients between the groundwater and surface water along the centerline of HBHA Pond.

Temporary Piezometers

Nine temporary piezometers were installed to collect groundwater samples from just below the Pond bottom. The piezometers consisted of the materials listed below:

- The piezometer systems consisted of the Solinst Model 601 piezometer (head), which was made of 3/4 in. diameter by 1 ft long perforated PVC fitted with an internal 60 micron filter sleeve.
- The piezometer head was attached to 3/4 in. diameter steel pipe that extended above the HBHA Pond water surface.
- Prior to installation, a section of 5/8 in. OD HDPE tubing was attached to the piezometer head and run through the steel riser pipe, with excess in place for sampling.

The piezometer systems were typically driven to depths varying from approximately 2 to 4 ft into the sand layer underlying the recent sediments in the Pond. Piezometers were driven by hand using a propane hammer. Following installation of the piezometer, the following information was collected at each location:

- Depth of water,
- Depth of soft sediment,
- Depth of surface water from reference point on piezometer,
- Depth to pond bottom from reference on piezometer, and
- Depth installed below sand layer.

After groundwater was sampled from the temporary system, the piezometers were removed. Due to on-going PDI activities, PZ-002 could not be sampled during this phase and was later installed and sampled as a semi-permanent piezometer.

Semi-Permanent Piezometers

Following review of the groundwater analytical data from the temporary piezometers, and following the installation of the PDI-16 chemocurtain structure, four semi-permanent piezometers were installed along the centerline of HBHA Pond, at PZ-002, PZ-005, PZ-007 and PZ-009.

The piezometer systems consisted of the Solinst Model 615 drive-point piezometer head (3/4 in. diameter by 1 ft long, perforated stainless steel with 50 mesh screen). The piezometer head and several feet of steel riser (length dependent on the depth the piezometer was driven below the sediment) were left in place below the sediment surface. The piezometer head was connected to 5/8 in. OD HDPE tubing that was brought to the pond surface. Semi-permanent piezometers were installed as follows:

- The piezometers were driven by hand using a propane hammer.
- The semi-permanent piezometers were driven to depths of 2 to 4 ft into the sand layer underlying the recent sediments in the Pond, consistent with the earlier installation and sampling depths.
- After driving to the desired depth, the drive pipe was extracted, leaving the piezometer in place with a short steel riser that extended to approximately the sediment surface.
- The tubing from the piezometer head extended to the water surface, was attached to the side of a buoy at the Pond surface, and then attached to a PVC riser installed on the buoy. This left the tubing visible against the side of the buoy, allowing quick comparison of the head difference between the pond surface and the piezometer. Excess tubing was coiled and strapped above the buoy.

The buoy system was independent of the piezometer tubing, and consisted of a buoy attached to an anchor weight placed at the Pond bottom. Excess rope was installed on the anchor line to allow for the fluctuation of the pond surface water level. Additional weights were added at the top section of the anchor line, which continually weighed the buoy enabling the buoy to remain in an upright orientation.

In December 2011, the surface water marker buoys and tubing for the semi-permanent piezometers were reconfigured in anticipation of ice forming on the pond during the winter months. The piezometer tubing was clamped, coiled, and attached to a smaller (6-in. diameter) buoy. The smaller buoy was sunk approximately 14 inches below the Pond surface.

Hydraulic Gradient Evaluation

In order to evaluate the hydraulic connection and the gradient between groundwater and surface water, water level measurements have been collected at each in-pond piezometer and monitoring well location. Water level data has been collected on a monthly basis, starting in June 2011 for the monitoring wells and in September 2011 for the in-pond piezometers.

Phase III - Monitoring Wells

Seven monitoring well couplets, which included both a shallow and a deep monitoring well, were installed along the eastern shore (MW-005S/D), western shore (MW-004S/D, MW-006S/D, MW-007S/D), and in the northern portions of the HBHA Pond (MW-001S/D, MW-002S/D, MW-003S/D) as part of Phase III to evaluate seasonal groundwater plume concentrations discharging to the Pond and vertical gradients.

- The drilling contractor used a Geoprobe® 6610 DT rubber-track mounted rig to advance approximate 2 in. diameter steel casing and stainless steel drive shoes to the desired depths of the monitoring wells.
- Shallow wells were generally installed with a 10 ft long screen. MW-001 through MW-003 well screens were installed from approximately 4 to 14 ft bgs; MW-004 and 005 were installed from approximately 5 to 15 ft bgs; MW-006S and MW-007S were screened from 4 to 9 ft bgs. Deeper wells were generally installed with a 5 ft long screened interval from approximately 15 to 20, or 20 to 25 ft bgs at each location.
- After the drilling contractor advanced the casing to the desired depth interval, the expendable drive point was knocked out and the 1 in. ID PVC slotted screen and riser pipe monitoring well sections were installed within the casing. As the outer casing was extracted from the borehole, filter sand was slowly placed in the annulus, creating a filter pack around the well screen, up to three ft above the screened interval. A 1.5 to 2 ft thick bentonite seal was then installed above the filter sand layer. Following removal of the casing, the remaining solid riser section of the well pipe was backfilled with bentonite grout to approximately 0.5 to 2 ft bgs. The well was completed with a 6-in flush mounted road box or a steel standpipe with a concrete finish at the ground surface.
- In most cases soil cores were collected to confirm the depth of groundwater at the monitoring well locations. Sample liners were discarded after use and soil cuttings were containerized and transported to the storage drums, located adjacent to the Groundwater Treatment Building (GWTB).
- Monitoring wells were developed in accordance with Haley & Aldrich Operating Procedure: OP3009 Monitoring Well Development Procedure, provided in Section 2.8 of the FSP.

2.2 SAMPLING

Phase I - Shoreline Groundwater Profiling

- After the sampling point was advanced and the screen exposed, either 1/4 in. or 3/8 in. ID HDPE tubing was inserted into the drill rig tooling riser pipe so the bottom of tubing was approximately 2.0 ft from the bottom of the screen, coinciding with center of the screened interval.

- Groundwater sampling was conducted by purging the screened profiling interval with a peristaltic pump and utilizing low-flow techniques to determine stabilization and sampling time in accordance with Haley & Aldrich operating procedure OP3012, “Low Stress/Low Flow Groundwater Sample Collection Procedure” provided in the FSP.
- Field parameters were monitored using a YSI Model 6920 V2-2 multi-parameter sonde or equivalent, installed in a flow-through cell. Parameters including dissolved oxygen, temperature, specific conductivity, pH, oxidation reduction potential and turbidity were continuously monitored until they had stabilized in accordance with OP3012. Turbidity was monitored using a HACH Model 2100p turbidimeter.
- At sampling locations where turbidity readings did not reach the target level of <5 NTU, groundwater samples were collected when all other parameters had reached stabilization criteria and turbidity readings stabilized within 10% for three consecutive readings. Deviations from stabilization criteria were documented on the groundwater sampling records.
- VOCs were collected first, at a pumping rate that did not exceed 100 mL/min. Samples were collected with no headspace in a 40 mL glass vial with a Teflon cap.
- Following collection of VOCs, an unfiltered sample was collected for ammonia analysis. Filtered and unfiltered samples were collected for arsenic analysis; filtered samples were passed through an in-line 0.45-micron filter.
- Upon completion of sampling, explorations were tremie-grouted with bentonite to the ground surface, and the ground surface was restored as appropriate (e.g., cold patch asphalt was placed in paved areas)

Phase II - In-Pond Groundwater Sampling

Groundwater samples were collected from each of the nine temporary piezometer locations installed along the centerline of HBHA Pond, immediately following the installation of the piezometers.

- The 5/8 in. OD HDPE tubing installed in the piezometer system was extended to the work boat and installed to a peristaltic pump. The tubing was purged of any residual water prior to sampling.
- Groundwater sampling was conducted using low-flow sampling techniques described in Phase I - Shoreline Groundwater Profiling, above.
- At many of the sampling locations where groundwater flow appeared minimal, distilled water was pumped into the piezometer tubing and a surging effort was applied to develop the piezometer and expel fines that may have accumulated in the piezometer head. The distilled water introduced into the tubing was purged prior to collecting parameter readings.
- Groundwater samples were collected from a sampling port located between the piezometer and the peristaltic pump minimizing the potential for any off-gassing during sample collection.
- Filtered and unfiltered samples were collected for arsenic analysis; filtered samples were passed through an in-line 0.45-micron filter. Unfiltered samples were collected for VOC and ammonia analysis.

Phase III - Monitoring Wells

Groundwater samples were collected from the monitoring well locations at least one week after the wells were developed. Groundwater sampling is being conducted on a quarterly basis for one year to evaluate seasonal variability in groundwater gradients and chemistry. The initial round of sampling was conducted in June 2011; quarterly sampling was conducted in August and November 2011.

Groundwater sampling was conducted using low-flow sampling techniques described in Phase I - Shoreline Groundwater Profiling, above. Filtered and unfiltered samples were collected for arsenic analysis; filtered samples were passed through an in-line 0.45-micron filter. Unfiltered samples were collected for VOC and ammonia analysis.

Groundwater samples were submitted to Alpha Analytical, Inc., of Westborough, Massachusetts. The groundwater samples from the shoreline groundwater profiling (PF-001 through PF-007), the in-pond sampling (PZ-001 through PZ-009), and the monitoring well sampling (MW-001S/D through MW-007S/D) were submitted for the following analyses: VOCs (benzene, 1,2-dichloroethane, trichloroethene, naphthalene) by EPA Method 8260, arsenic (total and dissolved) and total iron by EPA Method 6010, ammonia and ammonia by-products including nitrates, nitrites, and total nitrogen (including TKN) by Method SM 4500. Groundwater samples were analyzed in the field for ferrous iron using a Hach Spectrophotometer.

In addition, groundwater samples collected at two profiling locations along the western shoreline of HBHA Pond (PF-002 and PF-005) and one location along on the eastern shoreline (PZ-007) were submitted for sulfate by Method SM 4500, biochemical oxygen demand (BOD) by Method SM 5210, chemical oxygen demand (COD) by Method SM 5220 and total alkalinity. Samples collected at three of the HBHA Pond locations (PZ-002, PZ-003, and PZ-007) were also analyzed for sulfate by Method SM 4500 and total alkalinity by Method SM 2320.

In Situ Permeability Testing

In situ permeability testing, consisting of multiple rising and falling head tests using methods outlined in OP3016, was conducted at five monitoring well couplets surrounding Halls Brook Holding Area (HBHA) Pond (MW-001S/D through MW-005S/D). Results are provided in Exhibit 3A-1.

3. RESULTS

Groundwater analytical results are shown on Figures A3A-2 through A3A-5 and are provided in Tables A3A-I through A3A-III. Groundwater results are summarized below.

Phase I - Shoreline Groundwater Profiling

- The groundwater profiling samples that exceeded the ammonia cleanup standard of 4,000 µg/L were collected on the eastern shoreline of HBHA Pond in March 2009. Ammonia was detected above the cleanup standard in two of the three samples collected from each of the DP-1, DP-2 and DP-3 profiling locations, ranging from 4,000 to 133,000 µg/L. Ammonia concentrations were not detected above the cleanup standard from any of the PDI-3A groundwater profiling locations completed in 2011, at any depths sampled.

- Dissolved arsenic was detected above the cleanup standard of 150 µg/L in samples collected at two profiling locations (PF-004 and PF-005) along the western shoreline of HBHA Pond. The deepest sample collected from the PF-004 location had a concentration of dissolved arsenic of 301 µg/L. The second deepest sample collected from the PF-005 location had a concentration of dissolved arsenic of 219 µg/L. Results from profiling along the eastern shoreline conducted in March 2009 indicated arsenic was detected above the cleanup standard from two depth interval samples at DP-1 (at 151 and 162 µg/L), and at one sample from DP-3 and DP-4 locations, at 531 µg/L and 161 µg/L respectively.
- Volatile Organic Compounds:
 - Trichloroethene was detected above the cleanup standard of 1 µg/L in one groundwater profiling location, PF-001, located at the northwest end of HBHA Pond. The second and third deepest samples collected from the PF-001 location had trichloroethene concentrations of 57 and 27 µg/L, respectively.
 - Benzene was detected above the cleanup standard of 4 µg/L at the DP-1 and DP-2 sample locations. The second and third deepest samples collected from the DP-1 location had benzene concentrations of 340 and 4.1 µg/L, respectively. The second deepest sample collected from DP-2 location had a benzene concentration of 6.1 µg/L.
 - Concentrations of naphthalene, and 1,2-dichloroethane were not detected above their respective cleanup standards in any of the groundwater samples collected from the groundwater profiling locations.

Phase II – In-Pond Groundwater Sampling

- Ammonia was detected above the cleanup standard of 4,000 µg/L in samples collected at PZ-002 and PZ-003, located in the northern portion of HBHA Pond. Ammonia was detected at concentrations of 782,000 µg/L at PZ-002 and at 182,000 µg/L at PZ-003.
- Dissolved arsenic was detected above the cleanup standard of 150 µg/L in samples collected at PZ-002 and PZ-003, located in the northern portion of HBHA Pond. Dissolved arsenic was detected at concentrations of 326 µg/L at PZ-002 and at 608 µg/L at PZ-003.
- Volatile Organic Compounds:
 - Benzene was detected above the cleanup standard of 4 µg/L from samples collected at PZ-002 (820 µg/L) and PZ-003 (29 µg/L), located in the northern portion of HBHA Pond.
 - 1,2-Dichloroethane was detected above the cleanup standard of 2 µg/L in the sample collected at PZ-002 (29 µg/L).
 - Naphthalene was detected above the cleanup standard of 5 µg/ in the sample collected from PZ-002 (20 µg/L).
 - Trichloroethene was detected at or above the cleanup standard of 1 µg/L from samples collected at PZ-001 (1 µg/L) and PZ-002 (8.1 µg/L), located in the northern portion of HBHA Pond.

Phase III - Monitoring Wells

- Ammonia was detected above the cleanup standard of 4,000 µg/L from samples collected at five of the PDI-3A monitoring well locations (MW-001D, MW-002S, MW-002D, MW-003S, and MW-003D) located along the northeast section of HBHA Pond. Ammonia was detected above the cleanup

standard in each of the three sampling events (May/June, August and November) conducted at each well location, ranging from 9,100 to 495,000 µg/L.

- Dissolved arsenic was detected above the cleanup standard of 150 µg/L from samples collected at four of the PDI-3A monitoring well locations (MW-002S, MW-002D, MW-004D, and MW-005S) located along the northeast section of HBHA Pond.
- Volatile Organic Compounds:
 - Benzene was detected above the cleanup standard of 4 µg/L in three monitoring well locations (MW-002D, MW-003S and MW-003D). Benzene was detected above the cleanup standard in each of the three sampling events (May/June, August and November) conducted at each well location, ranging from 40 to 190 µg/L.
 - Napthalene, trichloroethene and 1,2-dichloroethane were not detected above the relevant cleanup standards in any samples collected from the PDI-3A monitoring well sampling locations.

Based on the PARCCS and data validation reviews, the data collected during PDI-3A were deemed to have met or exceeded the minimum standard requirements for field and analytical methods. Details of the PARCCS review and a summary of data validation are provided in Exhibit 3A-2. It has been determined the DQOs for PDI-3A have been attained.

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| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | MW-001S | | | MW-001D | | |
|--|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | | MW-001S-WG-01-052411 | MW-001S-WG-01-080111 | MW-001S-WG-01-110211 | MW-001D-WG-01-052411 | MW-001D-WG-01-080111 | MW-001D-WG-01-110211 |
| | | 5/24/2011 9:55 | 8/1/2011 10:20 | 11/2/2011 10:50 | 5/24/2011 11:54 | 8/1/2011 12:15 | 11/2/2011 12:20 |
| | | 4 - 14 | 4 - 14 | 4 - 14 | 20 - 25 | 20 - 25 | 20 - 25 |
| | | L1107230-01 | L1111576-01 | L1118076-01 | L1107230-02 | L1111576-03 | L1118076-02 |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.49 | 0.3 | 0.35 | 0.1 | 0.1U | 0.1U |
| NITRITE (AS N) | NA | 0.03J | 0.05U | 0.05U | 0.05U | 0.05U | 0.05U |
| NITROGEN, AMMONIA | 4 | 0.225 | 0.249 | 0.744 | 11.2 | 9.1 | 9.26 |
| NITROGEN, ORGANIC | NA | 0.3U | 0.3U | 1 | 0.8 | 0.3U | 1.7 |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.45 | 0.44U | 1.8 | 12 | 9.2 | 11 |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.002J | 0.005 | 0.004 | 0.003 | 0.003 | 0.003 |
| ARSENIC (DISSOLVED) | NA | 0.003U | 0.004 | 0.003U | 0.003 | 0.002J | 0.003U |
| IRON (TOTAL) | NA | 0.15 | 0.74 | 0.85 | 0.87 | 0.91 | 0.78 |
| VOCs (µg/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 0.75J | 0.56 | 0.5U | 0.5U | 0.5U |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 0 | - | - | 0.001 | - | - |
| AMMONIUM (mg/L) | 4 | 0.378 | - | - | 10.33 | - | - |
| CONDUCTIVITY (uS/cm) | NA | 1140 | 620 | 480 | 1843 | 997 | 914 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.49 | 1.21 | 0.92 | 0.41 | 1.09 | 0.63 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 164.8 | 95.3 | 149.8 | 158.9 | 155.8 | 164.5 |
| pH | NA | 5.86 | 7.8 | - | 5.51 | 5.45 | 5.4 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 1454 | 648 | 606 | 2252 | 1008 | 1153 |
| TEMPERATURE (C) | NA | 13.61 | 22.75 | 14.06 | 15.47 | 24.43 | 14.14 |
| TURBIDITY (NTU) | NA | 4.86 | 4.61 | 4.73 | 11.4 | 3.94 | 4.62 |
| FERROUS IRON (mg/L) | NA | 0.2 | 0.05 | 0.21 | 0.33 | 0.67 | 0.28 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. "-" INDICATES DATA NOT COLLECTED
 - 3. CLEANUP STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

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| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | MW-002S | | | MW-002D | | |
|--|-------------------------------------|----------------------|----------------------|----------------------|----------------------|--------------------|----------------------|
| | | MW-002S-WG-01-052411 | MW-002S-WG-01-080111 | MW-002S-WG-01-110311 | MW-002D-WG-01-060111 | 0553-FD-001-060111 | MW-002D-WG-01-080211 |
| | | 5/24/2011 13:44 | 8/1/2011 14:30 | 11/3/2011 9:15 | 6/1/2011 14:30 | 6/1/2011 0:00 | 8/2/2011 10:15 |
| | | 4 - 14 | 4 - 14 | 4 - 14 | 20 - 25 | 20 - 25 | 20 - 25 |
| | | L1107230-03 | L1111576-04 | L1118143-01 | L1107642-04 | L1107642-05 | L1111629-02 |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.27 | 0.89 | 0.17 | 0.09J | 0.11 | 0.06J |
| NITRITE (AS N) | NA | 0.05U | 0.05U | 0.08U | 0.03J | 0.03J | 0.05U |
| NITROGEN, AMMONIA | 4 | 17.1 | 16.3 | 15.6 | 328 | 320 | 323 |
| NITROGEN, ORGANIC | NA | 0.3U | 0.7 | 4.4 | 42J | 70 | 12U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 17 | 17 | 20 | 370 | 390 | 320 |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 1.85 | 1.86 | 2.44 | 1.64J | 1.56 | 1.61 |
| ARSENIC (DISSOLVED) | NA | 1.72 | 1.66 | 2.4 | 1.58J | 1.6 | 1.58 |
| IRON (TOTAL) | NA | 47 | 41 | 40 | 32J | 30 | 38 |
| VOCs (µg/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 54J | 51J | 51 |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.25J | 0.5U | 0.5U | 0.49J | 0.47J | 0.575 |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 0.008 | - | - | 2.118 | 2.118 | - |
| AMMONIUM (mg/L) | 4 | 14.75 | - | - | 731.4 | 731.4 | - |
| CONDUCTIVITY (uS/cm) | NA | 3412 | 1662 | 1570 | 3493 | 3493 | 3686 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.77 | 0.74 | 0.78 | 0.42 | 0.42 | 0.58 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -30.9 | -75.2 | 57.9 | -134.2 | -134.2 | -122 |
| pH | NA | 6.22 | 6.16 | 6.14 | 7.02 | 7.02 | 6.99 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 4018 | 1845 | 2140 | 4298 | 4298 | 3896 |
| TEMPERATURE (C) | NA | 17.1 | 19.8 | 11.06 | 15.16 | 15.16 | 22.17 |
| TURBIDITY (NTU) | NA | 1.71 | 1.24 | 2.04 | 12.1 | 12.1 | 9.77 |
| FERROUS IRON (mg/L) | NA | 37.95 | 29.8 | 27.4 | 18.9 | 18.9 | 20.2 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
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 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

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| Location | GROUNDWATER CLEANUP STANDARDS | MW-003S | | | | MW-00 | |
|------------------------------------|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sample ID | | MW-002D-WG-01-110211 | MW-003S-WG-01-060111 | MW-003S-WG-01-080211 | MW-003S-WG-01-110311 | MW-003D-WG-01-060111 | MW-003D-WG-01-080211 |
| Sample Date | | 11/2/2011 14:10 | 6/1/2011 10:00 | 8/2/2011 12:03 | 11/3/2011 10:50 | 6/1/2011 12:00 | 8/2/2011 14:20 |
| Sample Depth (FT) | | 20 - 25 | 4 - 14 | 4 - 14 | 4 - 14 | 20 - 25 | 20 - 25 |
| Lab Sample ID | | L1118076-04 | L1107642-02 | L1111629-03 | L1118143-02 | L1107642-03 | L1111629-05 |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.1U | 0.1U | 0.09J | 0.15 | 0.08J | 0.06J |
| NITRITE (AS N) | NA | 0.05U | 0.05U | 0.05U | 0.05U | 0.03J | 0.05U |
| NITROGEN, AMMONIA | 4 | 303 | 120J | 111 | 148 | 432 | 351 |
| NITROGEN, ORGANIC | NA | 27 | 10 | 19 | 12 | 68 | 120J |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 330 | 130 | 130 | 160 | 500 | 470 |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 1.64 | 0.081 | 0.081 | 0.082 | 0.065J | 0.064 |
| ARSENIC (DISSOLVED) | NA | 1.59 | 0.074 | 0.053 | 0.076 | 0.062J | 0.064 |
| IRON (TOTAL) | NA | 35 | 0.79 | 4.2 | 1.1 | 1.3J | 2.7J |
| VOCs (µg/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 1.2U |
| BENZENE | 4 | 40 | 50J | 74 | 190 | 190J | 190 |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 5U |
| TRICHLOROETHENE | 1 | 0.45J | 0.5U | 0.5U | 0.5U | 0.5U | 0.68J |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | - | 0.461 | - | - | 4.125 | - |
| AMMONIUM (mg/L) | 4 | - | 190.3 | - | - | 1025 | - |
| CONDUCTIVITY (uS/cm) | NA | 3064 | 1888 | 2151 | 1847 | 4302 | 4925 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.65 | 0.34 | 0.31 | 0.33 | 0.26 | 0.54 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -84.9 | -187.6 | -180.2 | -33 | -117.7 | -89.1 |
| pH | NA | 7 | 6.99 | 7.01 | 7.15 | 7.14 | 8.56 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 3940 | 2413 | 2282 | 2465 | 5228 | 4978 |
| TEMPERATURE (C) | NA | 13.35 | 13.61 | 22.01 | 11.89 | 15.73 | 24.43 |
| TURBIDITY (NTU) | NA | 4.49 | 1.4 | 1.46 | 2.12 | 4.82 | 4.48 |
| FERROUS IRON (mg/L) | NA | 27.4 | 0.38 | 0.72 | 0.59 | 1.01 | 0.43 |

- NOTES:
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 - 4. J QUALIFIER INDICATES ESTIMATED VALUE

 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | 3D | | MW-004S | | | |
|------------------------------------|-------------------------------------|--------------------|----------------------|----------------------|----------------------|----------------------|--------------------|
| Sample ID | | 0553-FD-001-080211 | MW-003D-WG-01-110311 | MW-004S-WG-01-062811 | MW-004S-WG-01-080511 | MW-004S-WG-01-110411 | 2287-FD-001-110411 |
| Sample Date | | 8/2/2011 0:00 | 11/3/2011 12:15 | 6/28/2011 14:45 | 8/5/2011 10:45 | 11/4/2011 11:50 | 11/4/2011 0:00 |
| Sample Depth (FT) | | 20 - 25 | 20 - 25 | 5 - 15 | 5 - 15 | 5 - 15 | 5 - 15 |
| Lab Sample ID | | L1111629-04 | L1118143-03 | L1109543-04 | L1111880-02 | L1118259-02 | L1118259-04 |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.1U | 0.1U | 0.86 | 0.65 | 0.73 | 0.73 |
| NITRITE (AS N) | NA | 0.05U | 0.05U | 0.05U | 0.05U | 0.05U | 0.05U |
| NITROGEN, AMMONIA | 4 | 437 | 495 | 0.075U | 0.229 | 0.269J | 0.375U |
| NITROGEN, ORGANIC | NA | 83J | 75 | 0.3U | 0.3U | 0.38U | 0.38U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 520 | 570 | 0.25J | 0.34J | 0.23J | 0.23J |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.061 | 0.061 | 0.004 | 0.002J | 0.003U | 0.003U |
| ARSENIC (DISSOLVED) | NA | 0.061 | 0.061 | 0.003 | 0.003U | 0.003U | 0.003U |
| IRON (TOTAL) | NA | 1.2J | 0.99 | 1.3 | 0.72 | 0.28 | 0.19 |
| VOCs (µg/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 1.2U | 1U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 190 | 160 | 0.5U | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 5U | 4U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.68J | 1U | 0.88 | 0.77 | 0.5U | 0.5U |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 4.125 | - | 0 | - | - | - |
| AMMONIUM (mg/L | 4 | 1025 | - | 0.085 | - | - | - |
| CONDUCTIVITY (uS/cm) | NA | 4302 | 3755 | 766 | 730 | 263 | 263 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.26 | 0.45 | 3.17 | 3.65 | 3.86 | 3.86 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -117.7 | -26.7 | 71 | 90.8 | 113.4 | 113.4 |
| pH | NA | 7.14 | 7.34 | 5.95 | 6.59 | 5.95 | 5.95 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 5228 | 4886 | 904 | 834 | 336 | 336 |
| TEMPERATURE (C) | NA | 15.73 | 12.88 | 17.04 | 18.39 | 13.62 | 13.62 |
| TURBIDITY (NTU) | NA | 4.82 | 3.31 | 4.63 | 3.41 | 1.08 | 1.08 |
| FERROUS IRON (mg/L) | NA | - | 0.83 | 0.56 | 1.13 | 0 | - |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | MW-004D | | | MW-005S | | |
|------------------------------------|-------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Sample ID | | MW-004D-WG-01-062911 | MW-004D-WG-01-080511 | MW-004D-WG-01-110411 | MW-005S-WG-01-062811 | MW-005S-WG-01-080311 | MW-005S-WG-01-110311 |
| Sample Date | | 6/29/2011 13:40 | 8/5/2011 13:10 | 11/4/2011 13:35 | 6/28/2011 10:15 | 8/3/2011 10:20 | 11/3/2011 14:20 |
| Sample Depth (FT) | | 25 - 25 | 25 - 25 | 20 - 25 | 5 - 15 | 5 - 15 | 5 - 15 |
| Lab Sample ID | | L1109625-01 | L1111880-03 | L1118259-03 | L1109543-02 | L1111705-02 | L1118143-05 |
| | | | | | | | |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.22 | 0.13 | 0.14 | 0.19 | 0.13 | 0.05J |
| NITRITE (AS N) | NA | 0.05U | 0.05U | 0.07U | 0.03J | 0.05U | 0.12U |
| NITROGEN, AMMONIA | 4 | 0.126 | 0.448 | 0.242J | 0.825 | 0.795 | 2.16 |
| NITROGEN, ORGANIC | NA | 0.3U | 0.6U | 0.38U | 1.2 | 2 | 3 |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.25J | 0.67J | 0.24J | 2 | 2.8 | 5.2 |
| | | | | | | | |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.312 | 0.329 | 0.402 | 0.216 | 0.23 | 0.142 |
| ARSENIC (DISSOLVED) | NA | 0.302 | 0.286 | 0.364 | 0.199 | 0.092 | 0.139 |
| IRON (TOTAL) | NA | 45 | 45 | 49 | 59 | - | 83 |
| | | | | | | | |
| VOCs (µg/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| | | | | | | | |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 0 | - | - | 0 | - | - |
| AMMONIUM (mg/L) | 4 | 0.354 | - | - | 0.323 | - | - |
| CONDUCTIVITY (uS/cm) | NA | 2931 | 2934 | 2453 | 1446 | 1345 | 1969 |
| DISSOLVED OXYGEN (mg/L) | NA | 1.1 | 1.05 | 0.82 | 0.76 | 0.87 | 0.65 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -81.5 | -81.7 | 63.6 | -68.1 | -59.1 | 0.7 |
| pH | NA | 6.53 | 6.96 | 6.38 | 6.38 | 6.45 | 6.37 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 3321 | 3373 | 5230 | 1593 | 1484 | 2022 |
| TEMPERATURE (C) | NA | 18.87 | 18.2 | 12.4 | 20 | 20.1 | 16.52 |
| TURBIDITY (NTU) | NA | 21.7 | 4.98 | 2.41 | 13.6 | 2.99 | 4.3 |
| FERROUS IRON (mg/L) | NA | 39 | 35.88 | 37 | 0.56 | 44.2 | 43.6 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | MW-005D | | |
|------------------------------------|-------------------------------------|----------------------|----------------------|----------------------|
| Sample ID | | MW-005D-WG-01-062811 | MW-005D-WG-01-080311 | MW-005D-WG-01-110411 |
| Sample Date | | 6/28/2011 13:00 | 8/3/2011 13:00 | 11/4/2011 10:00 |
| Sample Depth (FT) | | 20 - 25 | 20 - 25 | 20 - 25 |
| Lab Sample ID | | L1109543-03 | L1111705-03 | L1118259-01 |
| | | | | |
| NITROGEN SPECIES (mg/L) | | | | |
| NITRATE (AS N) | NA | 0.19 | 0.15 | 0.14 |
| NITRITE (AS N) | NA | 0.03J | 0.05U | 0.09U |
| NITROGEN, AMMONIA | 4 | 0.556 | 0.573 | 1.06 |
| NITROGEN, ORGANIC | NA | 0.94 | 1.5U | 0.74 |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 1.5 | 2 | 1.8 |
| | | | | |
| METALS (mg/L) | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.005 | 0.028 | 0.005 |
| ARSENIC (DISSOLVED) | NA | 0.006 | 0.004 | 0.004 |
| IRON (TOTAL) | NA | 37 | - | 48 |
| | | | | |
| VOCs (µg/L) | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 0.5U | 0.5U |
| | | | | |
| FIELD PARAMETERS | | | | |
| AMMONIA (mg/L) | 4 | 0 | - | - |
| AMMONIUM (mg/L) | 4 | 0.185 | - | - |
| CONDUCTIVITY (uS/cm) | NA | 1616 | 1541 | 1456 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.68 | 1.2 | 0.74 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 1 | 14.7 | 108.3 |
| pH | NA | 5.83 | 6.35 | 5.78 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 1713 | 1689 | 1839 |
| TEMPERATURE (C) | NA | 22.04 | 20.44 | 14.1 |
| TURBIDITY (NTU) | NA | 38.4 | 4.72 | 11.8 |
| FERROUS IRON (mg/L) | NA | 17 | 26.5 | 26.3 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | PZ-001 | PZ-002 | | PZ-003 | PZ-004 | PZ-005 | PZ-006 |
|------------------------------------|-------------------------------------|---------------------|---------------------|--------------------|---------------------|---------------------|--------------------|---------------------|
| Sample ID | | PZ-001-WG-01-052011 | PZ-002-WG-01-110711 | 2287-FD-001-110711 | PZ-003-WG-01-052511 | PZ-004-WG-01-052611 | PZ005-WG-01-063011 | PZ-006-WG-01-062811 |
| Sample Date | | 5/20/2011 12:50 | 11/7/2011 11:50 | 11/7/2011 0:00 | 5/25/2011 11:44 | 5/26/2011 13:30 | 6/30/2011 11:26 | 6/28/2011 13:00 |
| Sample Depth (FT) | | 16 - 17 | 13.5 - 14.5 | 13.5 - 14.5 | 13.37 - 14.37 | 10.9 - 11.9 | 11.8 | 5.5 - 6.5 |
| Lab Sample ID | | L1107107-01 | L1118400-01 | L1118400-02 | L1107307-01 | L1107431-01 | L1109715-01 | L1109542-01 |
| | | | | | | | | |
| NITROGEN SPECIES (mg/L) | | | | | | | | |
| NITRATE (AS N) | NA | 0.25 | 0.5U | 0.5U | 0.61 | 0.37 | 0.21 | 0.1 |
| NITRITE (AS N) | NA | 0.03J | 0.25U | 0.25U | 0.25U | 0.03J | 0.04J | 0.03J |
| NITROGEN, AMMONIA | 4 | 3.31 | 782 | 814 | 182 | 2.5 | 1.48 | 0.296 |
| NITROGEN, ORGANIC | NA | 0.59 | 68 | 96 | 4.8U | 1.8 | 1.1 | 0.3U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 3.9 | 850 | 910 | 180 | 4.3 | 2.6 | 0.48 |
| METALS (mg/L) | | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.027 | 0.308 | 0.325 | 0.66J | 0.086 | 0.147 | 0.027 |
| ARSENIC (DISSOLVED) | NA | 0.032 | 0.326 | 0.33 | 0.608 | 0.081 | 0.134 | 0.026 |
| IRON (TOTAL) | NA | 53 | 49 | 50 | 180J | 83 | 30 | 4 |
| VOCs (ug/L) | | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 29 | 29 | 0.97 | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 1 | 820 | 840 | 29 | 0.5U | 0.63 | 0.5U |
| NAPHTHALENE | 5 | 2U | 20U | 20U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 1 | 8.1 | 7.7 | 0.27J | 0.5U | 0.5U | 0.47J |
| OTHERS | | | | | | | | |
| ALKALINITY, TOTAL (mg caco3/l) | NA | - | 2700 | - | 630 | - | - | - |
| BOD, 5 DAY (mg/L) | NA | - | - | - | - | - | - | - |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | - | - | - | - | - | - | - |
| SULFATE (mg/L) | NA | - | 2500 | - | 2200 | - | - | - |
| FIELD PARAMETERS | | | | | | | | |
| AMMONIA (mg/L) | 4 | 0.001 | - | - | 0.206 | 0.001 | - | 0 |
| AMMONIUM (mg/L) | 4 | 1.96 | - | - | 146.6 | 1.514 | - | 0.215 |
| CONDUCTIVITY (uS/cm) | NA | 3499 | 6811 | 6811 | 9846 | 4395 | 1523 | 843 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.59 | 0.62 | 0.62 | 0.19 | 0.66 | 1.35 | 1.47 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -22.2 | 107.2 | 107.2 | -93.1 | -41.8 | 10 | 29.9 |
| pH | NA | 6.14 | 3.97 | 3.97 | 6.51 | 6.19 | 5.82 | 6.26 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 4473 | 8672 | 8672 | 10465 | 4956 | 1634 | 788 |
| TEMPERATURE (C) | NA | 13.6 | 13.76 | 13.76 | 21.91 | 19.08 | 21.44 | 28.56 |
| TURBIDITY (NTU) | NA | 4.34 | 2.52 | 2.52 | 14.1 | 6.43 | 4.57 | 4.51 |
| FERROUS IRON (mg/L) | NA | 47 | 43.6 | 43.6 | 103.6 | 50 | 32.2 | 0.05 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | PZ-007 | PZ-008 | PZ-009 |
|------------------------------------|-------------------------------------|---------------------|---------------------|---------------------|
| Sample ID | | PZ-007-WG-01-070511 | PZ-008-WG-01-071111 | PZ-009-WG-01-071111 |
| Sample Date | | 7/5/2011 12:15 | 7/11/2011 11:00 | 7/11/2011 14:05 |
| Sample Depth (FT) | | 14.8 - 15.8 | 17 - 18 | 14.15 - 15.15 |
| Lab Sample ID | | L1109882-02 | L1110258-01 | L1110258-03 |
| NITROGEN SPECIES (mg/L) | | | | |
| NITRATE (AS N) | NA | 0.74 | 0.08J | 1.1 |
| NITRITE (AS N) | NA | 0.11 | 0.05U | 0.03J |
| NITROGEN, AMMONIA | 4 | 3.78 | 0.19 | 0.136 |
| NITROGEN, ORGANIC | NA | 1.3 | 0.3U | 0.3U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 5.1 | 0.44 | 0.27J |
| METALS (mg/L) | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.016 | 0.008 | 0.009 |
| ARSENIC (DISSOLVED) | NA | 0.003 | 0.008 | 0.011 |
| IRON (TOTAL) | NA | 5.5J | 0.43 | 0.88 |
| VOCs (ug/L) | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5 | 0.38J | 0.5U |
| OTHERS | | | | |
| ALKALINITY, TOTAL (mg caco3/l) | NA | 63 | - | - |
| BOD, 5 DAY (mg/L) | NA | - | - | - |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | - | - | - |
| SULFATE (mg/L) | NA | 42 | - | - |
| FIELD PARAMETERS | | | | |
| AMMONIA (mg/L) | 4 | - | - | - |
| AMMONIUM (mg/L) | 4 | - | - | - |
| CONDUCTIVITY (uS/cm) | NA | 903 | 1026 | 1944 |
| DISSOLVED OXYGEN (mg/L) | NA | 3.74 | 1.25 | 1.03 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -2.3 | 148.4 | 74.8 |
| pH | NA | 6.61 | 6.42 | 6.36 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 929 | 1070 | 2016 |
| TEMPERATURE (C) | NA | 23.56 | 22.9 | 23.13 |
| TURBIDITY (NTU) | NA | 4.96 | 1.4 | 4.96 |
| FERROUS IRON (mg/L) | NA | 1.92 | 0.26 | 0.42 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-001 | | | | PF-002 | | |
|--|-------------------------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | | PF-001-WG-01-042111 | 0553-FD-001-042111 | PF-001-WG-02-042111 | PF-001-WG-03-042111 | PF-002-WG-01-041311 | PF-002-WG-02-041411 | PF-002-WG-03-041411 |
| | | 4/21/2011 10:00 | 4/21/2011 0:00 | 4/21/2011 12:00 | 4/21/2011 14:06 | 4/13/2011 13:15 | 4/14/2011 10:20 | 4/14/2011 13:35 |
| | | 8 - 12 | 8 - 12 | 18 - 22 | 27 - 31 | 10 - 14 | 20 - 24 | 30 - 34 |
| | | L1105503-02 | L1105503-03 | L1105503-04 | L1105503-05 | L1104970-01 | L1105043-01 | L1105043-03 |
| NITROGEN SPECIES (mg/L) | | | | | | | | |
| NITRATE (AS N) | NA | 2.6 | 2.6 | 0.14 | 0.3 | 2.1 | 0.1U | 0.28 |
| NITRITE (AS N) | NA | 0.05U | 0.03J | 0.05U | 0.05U | 0.05U | 0.05U | 0.05U |
| NITROGEN, AMMONIA | 4 | 0.121 | 0.14 | 1.06 | 1.78 | 0.332 | 0.515 | 0.295 |
| NITROGEN, ORGANIC | NA | 0.49 | 0.3U | 0.3U | 0.42 | 0.38 | 0.3U | 0.3U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.61 | 0.38 | 1.2 | 2.2 | 0.71 | 0.72 | 0.44 |
| METALS (mg/L) | | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.024J | 0.09 | 0.005 | 0.04 | 0.008J | 0.006 | 0.015 |
| ARSENIC (DISSOLVED) | NA | 0.003U | 0.003U | 0.003 | 0.01 | 0.004J | 0.006 | 0.009 |
| IRON (TOTAL) | NA | - | - | - | - | 0.86 | 9.6 | 15 |
| VOCs (ug/L) | | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.36J | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2UJ | 2UJ | 2UJ |
| TRICHLOROETHENE | 1 | 0.39J | 0.3J | 57 | 27 | 0.3J | 0.5U | 0.5U |
| OTHERS | | | | | | | | |
| ALKALINITY, TOTAL (mg cac03/l) | NA | - | - | - | - | 24 | 72 | 91 |
| BOD, 5 DAY (mg/L) | NA | - | - | - | - | 2U | 2U | 2U |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | - | - | - | - | 18J | 39 | 42 |
| SULFATE (mg/L) | NA | - | - | - | - | 40 | 38 | 31 |
| FIELD PARAMETERS | | | | | | | | |
| AMMONIA (mg/L) | 4 | - | - | - | - | - | 0 | 0 |
| AMMONIUM (mg/L) | 4 | 0.465 | 0.465 | 2.095 | 3.046 | - | 0.502 | 0.475 |
| CONDUCTIVITY (uS/cm) | NA | 454 | 454 | 0.863 | 1487 | 519 | 934 | 1196 |
| DISSOLVED OXYGEN (mg/L) | NA | 4.8 | 4.8 | 3.74 | 3.9 | 1.22 | -0.01 | 0.75 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 113.7 | 113.7 | 87.3 | -79.1 | 94.7 | -20.7 | -48.6 |
| pH | NA | 5.81 | 5.81 | 5.72 | 6.19 | 6.28 | 6.41 | 6.58 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 619 | 619 | 1168 | 1924 | - | - | - |
| TEMPERATURE (C) | NA | 11.15 | 11.15 | 11.38 | 13.13 | 7.14 | 9.94 | 12.38 |
| TURBIDITY (NTU) | NA | 86.3 | 86.3 | 56.4 | >1000 | 23.9 | 17.1 | 46.5 |
| FERROUS IRON (mg/L) | NA | 1 | 1 | 2.77 | 33.6 | 0.74 | 8.7 | 11.65 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-003 | | | PF-004 | | |
|--|-------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| | | PF-003-WG-01-041511 | PF-003-WG-02-041511 | PF-003-WG-03-041511 | PF-004-WG-01-041811 | PF-004-WG-02-041811 | PF-004-WG-03-041811 |
| | | 4/15/2011 9:20 | 4/15/2011 11:05 | 4/15/2011 13:55 | 4/18/2011 10:15 | 4/18/2011 12:35 | 4/18/2011 14:50 |
| | | 8 - 12 | 18 - 22 | 28 - 32 | 7 - 11 | 17 - 21 | 27 - 31 |
| | | L1105092-01 | L1105092-02 | L1105092-03 | L1105195-02 | L1105195-03 | L1105195-04 |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 1.4 | 0.3 | 0.36 | 0.68 | 0.22 | 0.26 |
| NITRITE (AS N) | NA | 0.04J | 0.03J | 0.05U | 0.05U | 0.03J | 0.05U |
| NITROGEN, AMMONIA | 4 | 0.124 | 0.071J | 0.189 | 0.04J | 0.044J | 0.261 |
| NITROGEN, ORGANIC | NA | 0.37 | 0.82 | 0.3U | 0.3U | 0.3U | 0.3U |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.49 | 0.82 | 0.48 | 0.22J | 0.27J | 0.49 |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.168 | 0.217 | 0.014U | 0.039 | 0.011 | 0.331 |
| ARSENIC (DISSOLVED) | NA | 0.013 | 0.003 | 0.005 | 0.009 | 0.006 | 0.301 |
| IRON (TOTAL) | NA | 15 | 36 | 14 | - | - | - |
| VOCs (ug/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2UJ | 2UJ | 2UJ | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.3J | 0.5U | 0.29J | 0.5U | 0.5U | 0.5U |
| OTHERS | | | | | | | |
| ALKALINITY, TOTAL (mg cac03/l) | NA | - | - | - | - | - | - |
| BOD, 5 DAY (mg/L) | NA | - | - | - | - | - | - |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | - | - | - | - | - | - |
| SULFATE (mg/L) | NA | - | - | - | - | - | - |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 0 | 0 | 0 | - | - | - |
| AMMONIUM (mg/L) | 4 | 0.39 | 0.664 | 0.78 | 0.234 | 1.042 | 1.253 |
| CONDUCTIVITY (uS/cm) | NA | 566 | 1190 | 1193 | - | - | - |
| DISSOLVED OXYGEN (mg/L) | NA | 1.18 | 0.43 | 0.68 | 7.34 | 2.9 | 2.39 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 83.2 | 26.6 | 7.1 | 144.4 | -6.9 | -63.6 |
| pH | NA | 6.19 | 6.35 | 6.47 | 6.37 | 6.49 | 6.64 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | - | - | - | 232 | 2230 | 2191 |
| TEMPERATURE (C) | NA | 8.67 | 11.18 | 12.12 | 11.03 | 13.83 | 14.13 |
| TURBIDITY (NTU) | NA | >1000 | >1000 | 42.5 | 51.6 | 83.6 | 960 |
| FERROUS IRON (mg/L) | NA | 0.53 | 0.97 | 10.9 | 0.28 | 14.35 | 30.36 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | PF-005 | | | PF-006 | | |
|------------------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Sample ID | | PF-005-WG-01-041911 | PF-005-WG-02-041911 | PF-005-WG-03-041911 | PF-006-WG-01-042011 | PF-006-WG-02-042011 | PF-006-WG-03-042011 |
| Sample Date | | 4/19/2011 10:10 | 4/19/2011 12:10 | 4/19/2011 14:05 | 4/20/2011 9:35 | 4/20/2011 11:30 | 4/20/2011 14:15 |
| Sample Depth (FT) | | 8 - 12 | 18 - 22 | 28 - 32 | 7 - 11 | 17 - 21 | 27 - 31 |
| Lab Sample ID | | L1105296-02 | L1105296-03 | L1105296-04 | L1105365-02 | L1105365-03 | L1105365-04 |
| | | | | | | | |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 1.4 | 0.25 | 0.29 | 0.18 | 0.31 | 0.38 |
| NITRITE (AS N) | NA | 0.05U | 0.05U | 0.05U | 0.05U | 0.05 | 0.05U |
| NITROGEN, AMMONIA | 4 | 0.066J | 0.171 | 0.053J | 0.075U | 0.453 | 0.456 |
| NITROGEN, ORGANIC | NA | 0.34 | 0.3U | 0.54 | 0.3U | 0.3U | 0.33 |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.34 | 0.29J | 0.54 | 0.15J | 0.71 | 0.79 |
| | | | | | | | |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.013U | 0.218 | 0.217 | 0.004U | 0.125 | 0.113 |
| ARSENIC (DISSOLVED) | NA | 0.004 | 0.219 | 0.137 | 0.004 | 0.102 | 0.076 |
| IRON (TOTAL) | NA | 2.1 | 34 | 51 | 1.2 | 57 | 68 |
| | | | | | | | |
| VOCs (ug/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 0.26J | 0.5U | 0.5U | 0.5U | 0.5U |
| | | | | | | | |
| OTHERS | | | | | | | |
| ALKALINITY, TOTAL (mg cac03/l) | NA | 48 | 65 | 65 | - | - | - |
| BOD, 5 DAY (mg/L) | NA | 2U | 2U | 2U | - | - | - |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | 23 | 32 | 82 | - | - | - |
| SULFATE (mg/L) | NA | 27 | 41 | 38 | - | - | - |
| | | | | | | | |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | - | - | - | - | - | - |
| AMMONIUM (mg/L) | 4 | 1.041 | 0.766 | 0.596 | 0.216 | 3.825 | 3.092 |
| CONDUCTIVITY (uS/cm) | NA | - | - | - | - | - | - |
| DISSOLVED OXYGEN (mg/L) | NA | 7.44 | 3.38 | 2.06 | 2.49 | 2.04 | 1.49 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 136.6 | -92.3 | -136.2 | 96 | -95.4 | -95.9 |
| pH | NA | 6.04 | 6.87 | 7.11 | 6.04 | 6.41 | 6.52 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 777 | 1937 | 1741 | 177 | 5289 | 2700 |
| TEMPERATURE (C) | NA | 10.04 | 11.9 | 12.39 | 8.88 | 10.73 | 11.49 |
| TURBIDITY (NTU) | NA | 28.4 | 15.2 | >1000 | 4.86 | >1000 | >1000 |
| FERROUS IRON (mg/L) | NA | 0.71 | 2.44 | 21.5 | 0.8 | 32.52 | 32.04 |

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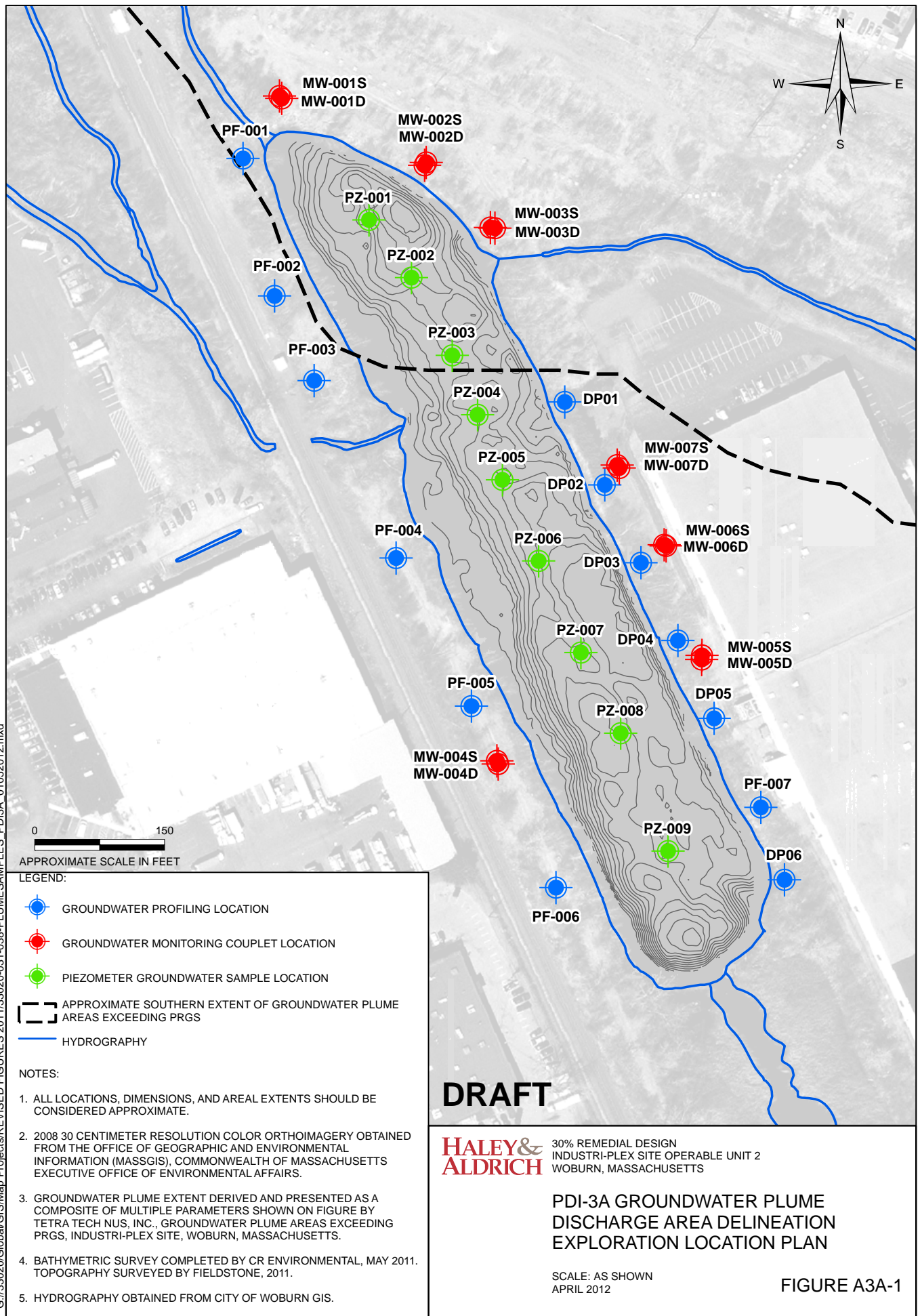
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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

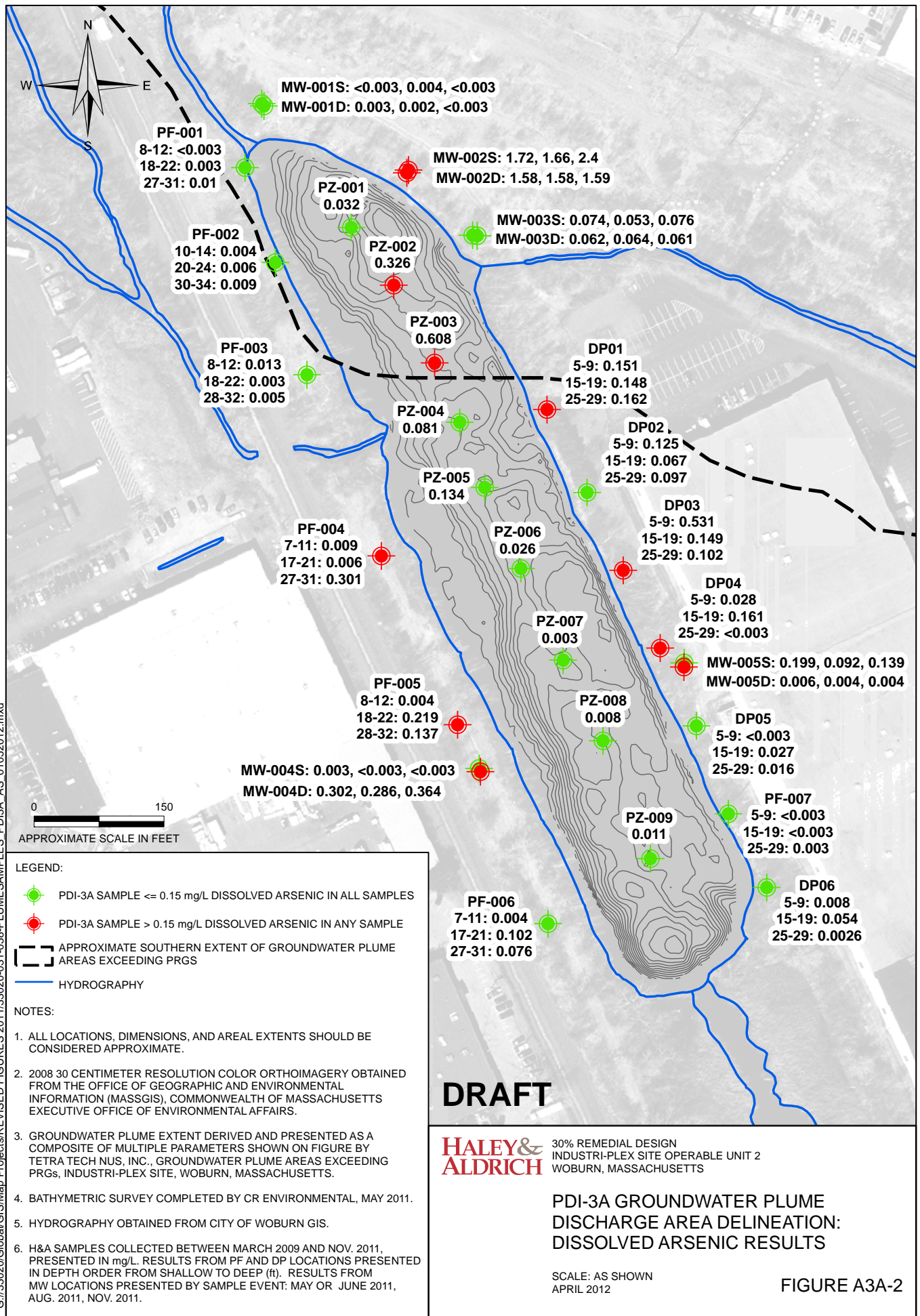
| Location | GROUNDWATER CLEANUP STANDARDS | PF-007 | | |
|------------------------------------|-------------------------------------|---------------------|---------------------|---------------------|
| Sample ID | | PF-007-WG-01-041611 | PF-007-WG-02-041611 | PF-007-WG-03-041611 |
| Sample Date | | 4/16/2011 10:25 | 4/16/2011 12:15 | 4/16/2011 14:25 |
| Sample Depth (FT) | | 5 - 9 | 15 - 19 | 25 - 29 |
| Lab Sample ID | | L1105166-01 | L1105166-02 | L1105166-03 |
| NITROGEN SPECIES (mg/L) | | | | |
| NITRATE (AS N) | NA | 0.72 | 0.17 | 0.28 |
| NITRITE (AS N) | NA | 0.03J | 0.05U | 0.03J |
| NITROGEN, AMMONIA | 4 | 0.198 | 0.126 | 0.319 |
| NITROGEN, ORGANIC | NA | 0.3U | 0.34 | 0.78 |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 0.31 | 0.47 | 1.1 |
| METALS (mg/L) | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.011 | 0.026 | 0.065 |
| ARSENIC (DISSOLVED) | NA | 0.003U | 0.003U | 0.003 |
| IRON (TOTAL) | NA | 9.2 | 44 | 74 |
| VOCs (ug/L) | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2UJ | 2UJ | 2UJ |
| TRICHLOROETHENE | 1 | 0.5U | 0.5U | 0.5U |
| OTHERS | | | | |
| ALKALINITY, TOTAL (mg caco3/l) | NA | 29 | 61 | 100 |
| BOD, 5 DAY (mg/L) | NA | 2U | 2U | 5.1J |
| CHEMICAL OXYGEN DEMAND (mg/L) | NA | 35 | 140 | 220 |
| SULFATE (mg/L) | NA | 17 | 99 | 260 |
| FIELD PARAMETERS | | | | |
| AMMONIA (mg/L) | 4 | 0 | 0 | 0 |
| AMMONIUM (mg/L) | 4 | 0.314 | 0.626 | 0.62 |
| CONDUCTIVITY (uS/cm) | NA | 231 | 2016 | 2237 |
| DISSOLVED OXYGEN (mg/L) | NA | 2.79 | 1.2 | 1.7 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 36.6 | -24.9 | -54.2 |
| pH | NA | 6.26 | 5.99 | 6.14 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | - | - | - |
| TEMPERATURE (C) | NA | 11.92 | 14.05 | 13.37 |
| TURBIDITY (NTU) | NA | 277 | >1000 | >1000 |
| FERROUS IRON (mg/L) | NA | 0.7 | - | 53.4 |

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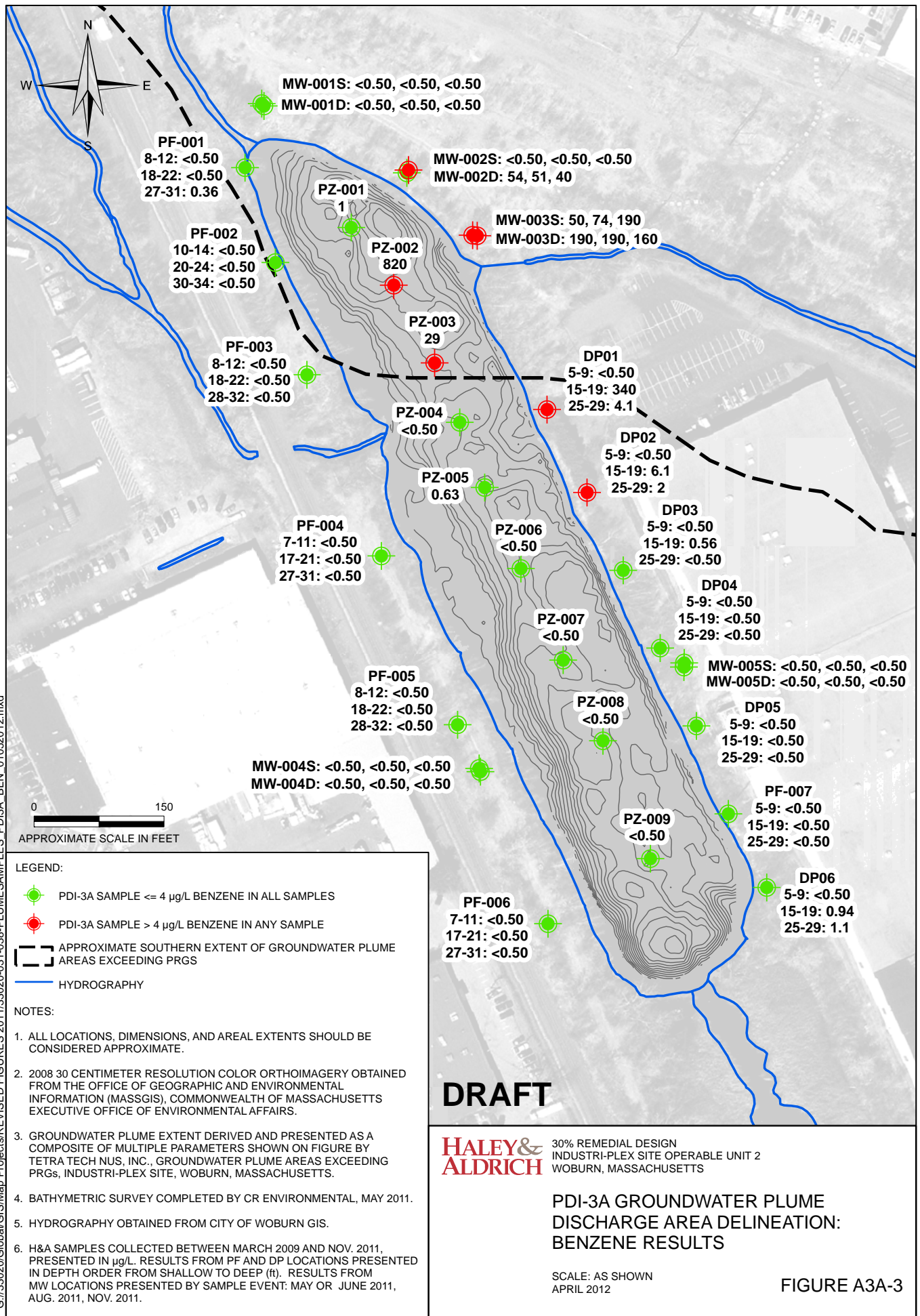
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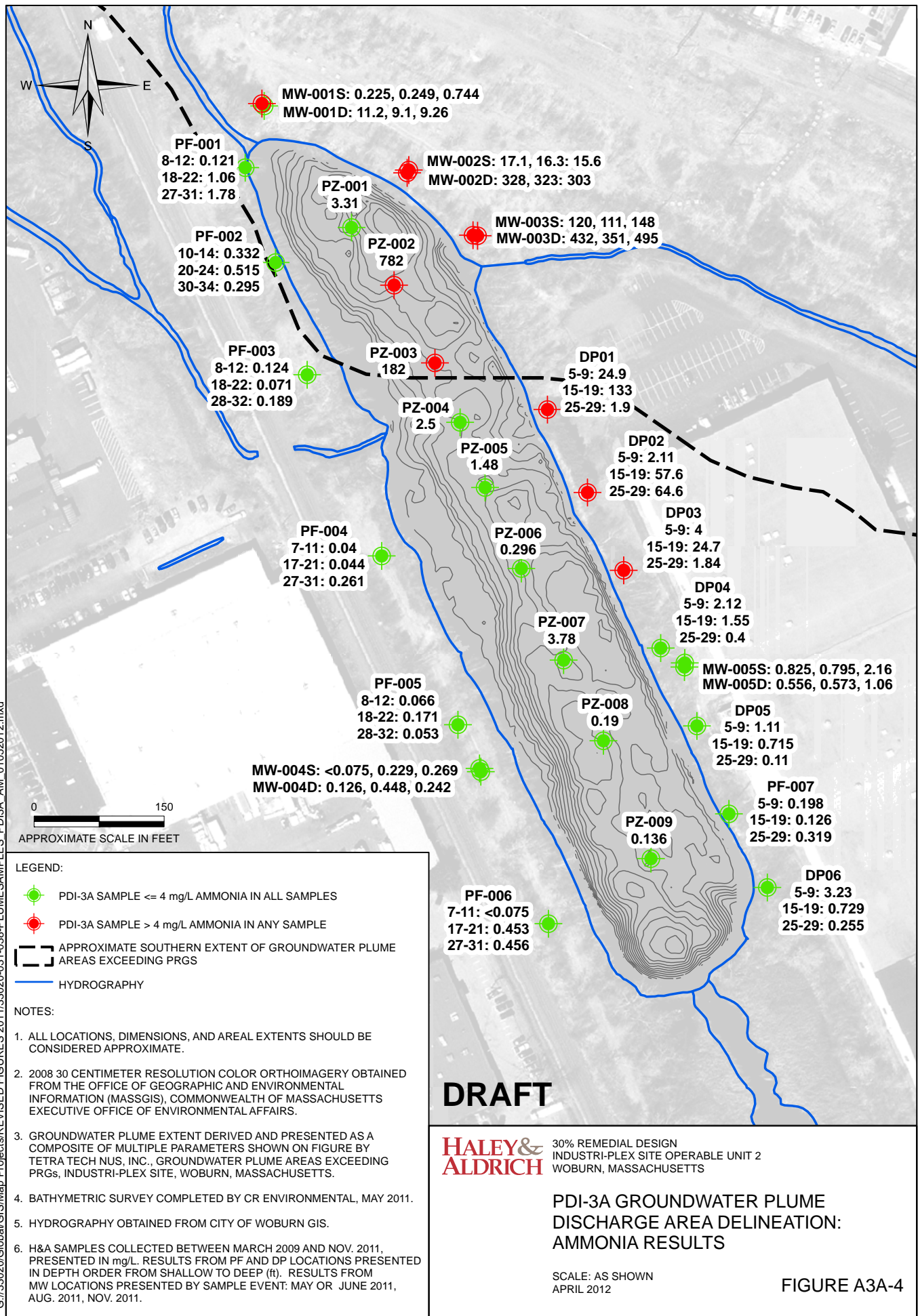
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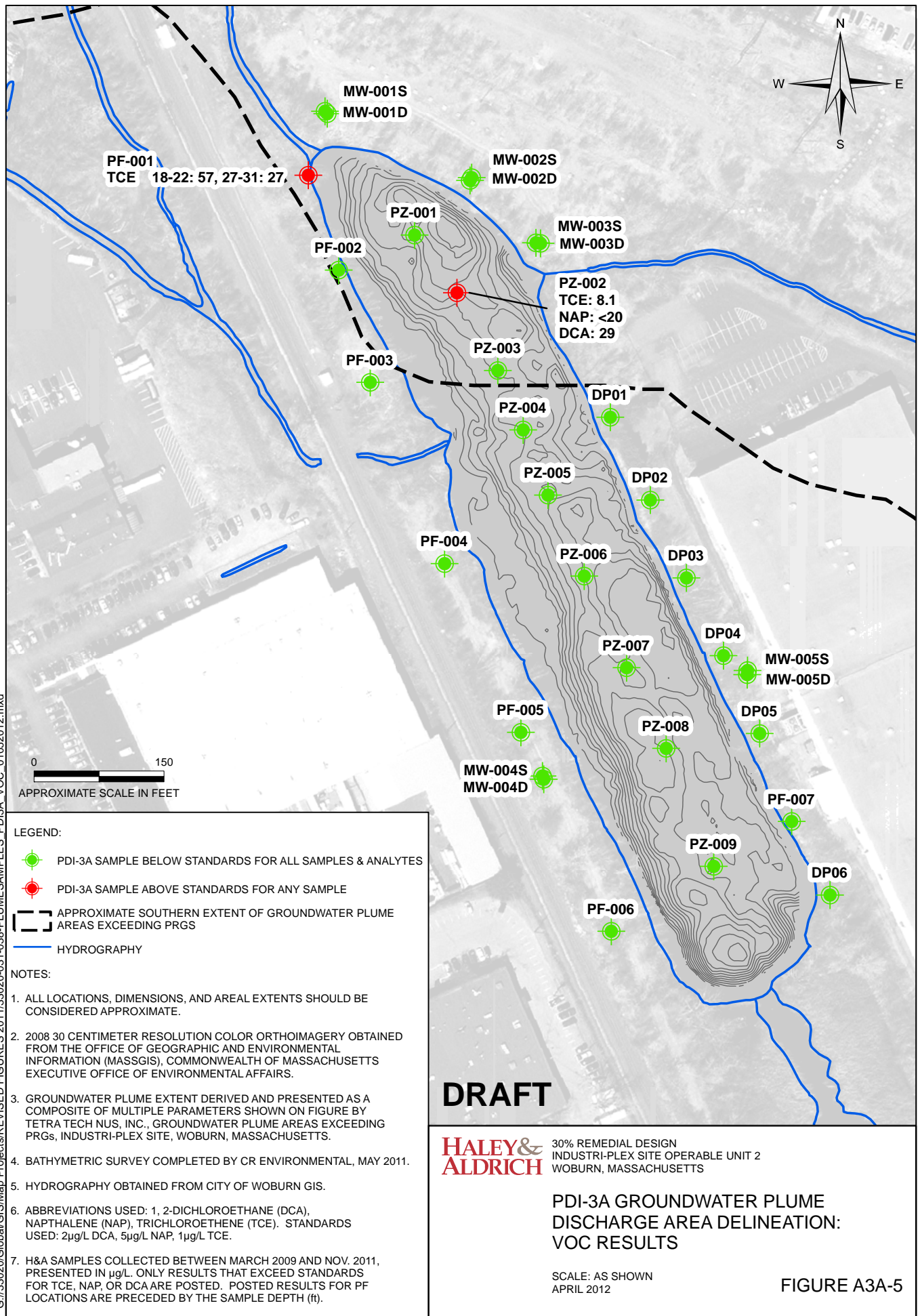
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ATTACHMENT A3B

PDI-3B Sitewide Groundwater Plume Investigation

1. OBJECTIVES AND SCOPE

The hide piles located within Industri-plex OU1 represent a significant source of the groundwater plumes observed at the Site; however, there are no permanent monitoring wells to evaluate how the plumes may be changing over time. As groundwater discharge is the most significant known contribution of contaminants to HBHA Pond, the design of the final remedy must include potential changes in the concentration and location of the groundwater plumes over time.

The objectives of PDI-3B, as detailed on pages 14 to 15 of the FSP dated 25 March 2011, were to:

- 1) Collect time-series data for the contaminants of concern (COCs) at select locations to assist in the design of the final remedy for the HBHA Pond,
- 2) Define portions of the Site requiring Institutional Controls (ICs) to prevent exposures to groundwater, and
- 3) Design a long-term groundwater monitoring network.

Snapshot groundwater profiling was conducted along six transects between the northern limits of OU-1 and the HBHA Pond, as shown on Figure A3B-1. Also shown on this figure are the locations of three monitoring wells (MW-101, MW-102, MW-103) and three groundwater profiling locations (PF-130, PF-131, PF-132) which were installed at the base of the West Hide Pile (WHP).

2. IMPLEMENTATION SUMMARY

To evaluate the extent and stability of the groundwater plume, a snap-shot groundwater investigation was implemented along six groundwater transects ranging from the northern boundary of the Site to HBHA Pond. Groundwater sampling locations were captured using a handheld global positioning system (GPS) and subsequently surveyed by a Professional Land Surveyor.

Site-Wide Snapshot Profiling

Installation

Thirty groundwater snapshot profiling locations were conducted as described below:

- Groundwater profiling was conducted using a Geoprobe® 6610 DT rubber-track mounted rig to advance stainless steel sampling points to a depth approximately 7 ft below observed water table at each location (PF-100 through PF-130).
- At locations where water table depth could not be confirmed by previous explorations, existing monitoring wells, or inferred from nearby surface water features, a 1 7/8 in. ID Geoprobe® soil sampling sleeves were advanced to confirm depth of groundwater (as observed in the soil samples) prior to the advancement of the initial stainless steel sampling point.
- After the drilling contractor advanced the sampling points to the desired depth interval, the tooling was pulled back to expose the 4 feet (ft) length of stainless steel screen from which groundwater samples were collected.

Sampling

- After the sampling point was advanced and the screen exposed, either 1/4 in. or 3/8 in. ID HDPE tubing was inserted into the drill rig tooling riser pipe and installed so that the bottom of tubing was approximately 2 ft from the bottom of the screen, coinciding with center of the screened interval and 5 ft below the observed water table.
- Groundwater sampling was conducted in accordance with Haley & Aldrich operating procedure OP3012, "Low Stress/Low Flow Groundwater Sample Collection Procedure."
- Field parameters were monitored using a YSI Model 6920 V2-2 multi-parameter sonde or equivalent, installed in a flow-through cell. Parameters including dissolved oxygen, temperature, specific conductivity, pH, oxidation reduction potential and turbidity were continuously monitored until they had stabilized in accordance with OP3012. Turbidity was monitored using a HACH Model 2100p turbidimeter.
- At sampling locations where turbidity readings did not reach the target level of <5 NTU, groundwater samples were collected when all other parameters had reached stabilization criteria and turbidity readings stabilized within 10% for three consecutive readings. Deviations from stabilization criteria were documented on the groundwater sampling records.
- Following field parameter stabilization, the tubing was removed from the flow-through cell and samples were collected. Volatile organic compounds (VOCs) were collected first, at a pumping rate that did not exceed 100 mL/min. Samples were collected with no headspace in a 40 mL glass vial with a Teflon® cap.
- Following collection of VOCs, an unfiltered sample was collected for ammonia analysis. Filtered and unfiltered samples were collected for arsenic analysis; filtered samples were passed through an in-line 0.45-micron filter.
- Upon completion of sampling, explorations were tremie-grouted with bentonite to the ground surface, and the ground surface was restored as appropriate (e.g., cold patch asphalt was placed in paved areas).
- Investigative derived waste was containerized and transported to the drum storage area.

West Hide Pile Monitoring Wells

Installation

Three monitoring wells were installed along the eastern edge of the WHP, to evaluate seasonal fluctuations in groundwater chemistry and to measure hydraulic gradients. These wells were installed in support of PDI-9.

- The drilling contractor advanced approximate 2 in. diameter stainless steel rods/casing and drive shoes using a Geoprobe® 6610 DT rubber-track mounted rig at locations MW-101, MW-102, and MW-103.

- Monitoring well MW-101 was screened from 4 to 14 ft depth, generally at the same interval of the former RX-19 sampling intervals. Monitoring well MW-102 was screened from 4 to 14 ft depth, generally at the same interval of the former RX-18 shallow and intermediate sampling intervals. Monitoring well MW-103 was screened from 4 to 14 ft.
- After the drilling contractor advanced the casing and drive point to the desired depth interval, the drive point was knocked out and the 1 in. ID PVC slotted screen and riser pipe monitoring well sections were installed within the casing. As the outer casing was slowly extracted from the borehole, filter sand was slowly placed in the annulus, creating a filter pack around the well screen, up to three ft above the screened interval. A 1.5- to 2 ft-thick bentonite seal was then installed over the filter sand layer. Following removal of the casing, the remaining solid PVC riser section of the well pipe was backfilled with bentonite grout to approximately 0.5 to 2 ft below the ground surface. A five foot steel guard pipe was installed and concrete was added up to the ground surface.

Well Development

Following installation, monitoring wells were developed in general accordance with Operating Procedure: OP3009 Monitoring Well Development Procedure.

Groundwater Sampling

Groundwater samples were collected from the monitoring well locations at least one week after the wells were developed. Groundwater sampling at the PDI-3B monitoring wells was also conducted during the PDI-3A quarterly groundwater sampling rounds. The initial round of sampling was conducted in June, while quarterly sampling was conducted in August and November 2011. Groundwater sampling was conducted by purging the screened profiling interval with a peristaltic pump and using low-flow techniques described in “Site-wide Snapshot Profiling Sampling” above.

West Hide Pile Groundwater Profiling

Groundwater Profiles

Three additional groundwater profiling locations, PF-130, PF-131 and PF-132 were added to the PDI-3B sampling program after review of the results of groundwater sampling conducted at monitoring wells MW-101 MW-102 and MW-103. Groundwater profiling was conducted to further evaluate benzene contamination at the WHP in the vicinity of former monitoring well locations RX-18 and RX-19. Sampling of these three additional groundwater profiling locations was conducted using the same method described in “Site-wide Snapshot Profiling Installation” above.

Profiling location PF-130 was located adjacent to MW-101 and was sampled from screened intervals at 6 to 10 ft and 10 to 14 ft depths, directly corresponding with the former RX-19 intermediate and deep sampling intervals. Profiling location PF-131 was located adjacent to the MW-102 and sampled from screened intervals at 2 to 6 ft, 9 to 13 ft. and 19 to 23 ft. depths, directly corresponding with the former RX-18 shallow, intermediate and deep sampling intervals.

Profiling location PF-132 was located adjacent to the MW-103 and sampled from screened intervals at 2 to 6 ft, 9 to 13 ft and 19 to 23 ft depths.

Sampling

Sampling was conducted using the same low flow techniques discussed in “Site-wide Snapshot Profiling Sampling” above. Groundwater samples were submitted to Alpha Analytical, Inc., of Westborough, Massachusetts.

Groundwater profiling samples (PF-100 through PF-132) were submitted for analysis of benzene, 1,2-dichloroethane, trichloroethene, and naphthalene by EPA Method 8260, arsenic (total and dissolved) by EPA Method 6010, and ammonia by Method SM 4500.

Groundwater samples collected at monitoring wells during the initial round of sampling were submitted for the analytes listed above, as well as ammonia by-products including nitrates, nitrites, and total nitrogen (including TKN) (by Method SM 4500). During subsequent quarterly groundwater sampling, samples were not analyzed for ammonia by-products.

3. RESULTS

Groundwater sampling conducted as part of PDI-3B can be separated into three sampling events: 1) site-wide snapshot profiling (PF-100 through PF-129, 2) WHP monitoring well sampling (MW-101 through MW-103), and 3) WHP groundwater profiling (PF-130 through PF-132). Groundwater sampling results are shown on Figures A3B-2 through A3B-5 and are provided in Tables A3B-I and A3B-II. The results are summarized below.

Site-Wide Snapshot Groundwater Profiling

- Ammonia was detected at concentrations exceeding the cleanup standard of 4,000 µg/L at thirteen snapshot sampling locations (PF-103, PF-109, PF-110, PF-114, PF-118, PF-120, PF-121, PF-122, PF-123, PF-125, and PF-126). Ammonia concentrations ranged from 4,420 to 201,000 µg/L.
- Dissolved arsenic was detected at concentrations exceeding the cleanup standard (150 µg/L) at seven locations (PF-103, PF-106, PF-108, PF-113, PF-116, PF-117, and PF-118). Concentrations ranged from 217 µg/L to 2,880 µg/L.
- VOCs:
 - Benzene was detected above the cleanup standard of 4 µg/L at PF-123 (36 µg/L), only.
 - Naphthalene was detected above the cleanup standard of 5 µg/L at PF-118 (8.2 µg/L) and PF-121 (8 µg/L).
 - Trichloroethene and 1,2-dichloroethane were not detected above the cleanup standard at any of the PDI-3B snapshot sampling locations.

Groundwater Monitoring Wells

- Ammonia was detected above the cleanup standard of 4,000 µg/L from the three monitoring well sampling locations (MW-101, MW-102, and MW-103) during the four rounds of monitoring. Maximum concentrations of ammonia detected in each well were 15,300 µg/L at MW-101, 11,900 µg/L at MW-102, and 51,200 µg/L at MW-103.
- Dissolved arsenic was not detected above the cleanup standard (150 µg/L) at any of the PDI-3B monitoring wells.

- VOCs:
 - Benzene was detected above the cleanup standard of 4 µg/L at MW-102 (23 µg/L).
 - Concentrations of naphthalene, trichloroethene and 1,2-dichloroethane were not detected above the cleanup standards in any of the three monitoring wells.

WHP Groundwater Profiling

- Ammonia was detected above the cleanup standard of 4,000 µg/L in all but one of the groundwater profiling locations at the WHP. The shallow and deep samples collected from PF-130 had ammonia concentrations of 13,300 and 18,500 µg/L, respectively. The intermediate and deep samples collected from PF-131 had ammonia concentrations of 28,400 and 201,000 µg/L, respectively. All three intervals (shallow, intermediate and deep) collected from PF-132 had ammonia concentrations of 8,980, 67,000 and 4,420 µg/L, respectively.
- Dissolved arsenic was not detected above the cleanup standard (150 µg/L) at any of the PDI-3B locations.
- VOCs:
 - Benzene was detected above the cleanup standard of 4 µg/L in all three depth intervals from PF-131, at 180 µg/L, 7,300 µg/L, and 1,200 µg/L).
 - Concentrations of naphthalene, trichloroethene and 1,2-dichloroethane were not detected above the cleanup standards in any of the groundwater samples collected.

Based on the PARCCs and data validation reviews, the data collected during PDI-3B were deemed to have met or exceeded the minimum standard requirements for field and analytical methods. Details of the PARCCS review and a summary of data validation are provided in the supporting information for PDI-3A (in Exhibit A3A-3). It has been determined the DQOs for PDI-3B have been attained.

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WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-100 | PF-101 | PF-102 | PF-103 | PF-104 | PF-105 |
|---|---|--|---|--|---|--|---|
| | | PF-100-WG-01-040711 4/7/2011 14:50 6 - 10 L1104648-02 | PF-101-WG-01-040711 4/7/2011 12:05 5 - 9 L1104648-01 | PF-102-WG-01-042511 4/25/2011 15:00 11 - 15 L1105586-03 | PF-103-WG-01-112111 11/21/2011 0:00 5 - 9 L1119465-03 | PF-104-WG-01-040811 4/8/2011 10:20 8 - 12 L1104745-01 | PF-105-WG-01-042911 4/29/2011 13:30 8 - 12 L1105911-02 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 0.066J | 1.3 | 0.075U | 6.64 | 0.253 | 0.92 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.003U 0.003U | 0.011 0.003 | 0.008 0.003 | 2.97 2.88 | 0.003U 0.003U | 0.364 0.12 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2UJ 0.5U | 0.5U 0.5U 2UJ 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.57 | 0.5U 0.5U 2UJ 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - - 7.48 129.9 4.51 53 8.01 15.4 0.3 | - - - 7.2 6.43 627 8.34 37.3 3.41 | 0.11 121 12.62 9.7 6.88 168 10.45 182 0.15 | - 703 0.67 -109.9 7.06 963 10.88 4.22 - | - - - 85.7 5.2 187 10.02 40.2 0.73 | - 492 - -18.6 6.56 600 15.64 >1000 - |

- NOTES:
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 - 3. CLEANUP STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-106 | PF-106 | PF-107 | PF-108 | PF-109 | PF-110 |
|--|-------------------------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| | | PF-106-WG-01-112111 | 2287-FD-001-112111 | PF-107-WG-01-051111 | PF-108-WG-01-042511 | PF-109-WG-01-042211 | PF-110-WG-01-042211 |
| | | 11/21/2011 9:30 | 11/21/2011 0:00 | 5/11/2011 11:00 | 4/25/2011 10:15 | 4/22/2011 13:45 | 4/22/2011 10:45 |
| | | 5 - 9 | 5 - 9 | 11 - 15 | 8 - 12 | 8 - 12 | 8 - 12 |
| | | L1119465-02 | L1119465-01 | L1106583-02 | L1105586-02 | L1105529-03 | L1105529-02 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 8.82 | 8.62 | 0.844 | 0.154 | 4.79 | 10.9 |
| METALS (mg/L) ARSENIC (TOTAL) | 0.15 | 1.52 | 1.48 | 0.07 | 1.26 | 0.055 | 0.009 |
| ARSENIC (DISSOLVED) | NA | 1.43 | 1.42 | 0.066 | 0.886 | 0.007 | 0.006 |
| VOCs (ug/L) 1,2-DICHLOROETHANE | 2 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U | 0.5U | 1 | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U | 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) | 4 | - | - | - | 0.094 | 9.07 | 21.72 |
| CONDUCTIVITY (uS/cm) | NA | 1712 | 1712 | 223 | 418 | 1219 | 885 |
| DISSOLVED OXYGEN (mg/L) | NA | -117.2 | -117.2 | 0.72 | 1.38 | 7.67 | 6.98 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | 0.78 | 0.78 | -6.6 | -155.1 | 127.4 | -94 |
| pH | NA | 6.56 | 6.56 | 6.04 | 6.79 | 4.73 | 6.3 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 2305 | 2305 | 300 | 661 | 1732 | 1230 |
| TEMPERATURE (C) | NA | 11.53 | 11.53 | 11.58 | 5.76 | 9.47 | 10.29 |
| TURBIDITY (NTU) | NA | 7.69 | 7.69 | 25.1 | 274 | 64.8 | 26.8 |
| FERROUS IRON (mg/L) | NA | - | - | - | 1.75 | 2.67 | 2.35 |

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-111 | PF-112 | PF-113 | PF-113 | PF-114 | PF-115 |
|---|---|--|--|--|--|--|--|
| | | PF-111-WG-01-040811 4/8/2011 14:00 7 - 11 L1104745-02 | PF-112-WG-01-112211 11/22/2011 10:45 6 - 10 L1119563-01 | PF-113-WG-01-051111 5/11/2011 14:40 11 - 15 L1106583-03 | 0553-FD-001-051111 5/11/2011 0:00 11 - 15 L1106583-04 | PF-114-WG-01-051211 5/12/2011 10:30 13 - 17 L1106672-02 | PF-115-WG-01-051811 5/18/2011 13:35 13 - 17 L1106962-02 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 0.618 | 16.3 | 3.1 | 3.27 | 5.68 | 0.212U |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.125 0.126 | 0.099 0.089 | 0.284 0.281 | 0.292 0.296 | 0.106 0.079 | 0.004 0.003U |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2UJ 0.25J | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.35J 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - - - 15.4 5.05 571 11.24 9.78 2.18 | - 1436 5.05 38 5.91 1917 11.87 56.1 - | - 1253 0.54 -88.7 7.2 1454 17.75 780 - | - 1253 0.54 -88.7 7.2 1454 17.75 780 - | - 1571 0.66 97.3 6.76 2088 12.02 19.1 - | - 513 3.03 142.2 5.99 717 10.06 20.1 - |

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-116 | PF-117 | PF-118 | PF-119 | PF-120 | PF-121 |
|---|---|---|---|--|--|---|--|
| | | PF-116-WG-01-041111 4/11/2011 12:55 8 - 12 L1104839-02 | PF-117-WG-01-041111 4/11/2011 10:18 6 - 10 L1104839-01 | PF-118-WG-01-051311 5/13/2011 11:30 18 - 22 L1106766-01 | PF-119-WG-01-051211 5/12/2011 14:15 18 - 22 L1106672-03 | PF-120-WG-01-051611 5/16/2011 15:05 14 - 18 L1106833-03 | PF-121-WG-01-051611 5/16/2011 12:15 15 - 19 L1106833-02 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 0.074J | 2.39 | 6.89 | 3.85 | 80.8 | 112 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.228 0.217 | 0.903 0.903 | 0.829 0.798 | 0.138 0.136 | 0.012 0.011 | 0.067 0.05 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.84 8.2 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.8 8 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - 548 9.09 157.8 6.21 - 10.9 4.07 - | - 863 0.3 57.2 5.57 - 11.57 2.7 - | - 4606 0.79 36.8 6.69 5481 16.63 10.5 - | - 1119 0.91 65 5.5 1389 14.81 141 - | - 1509 0.5 -104.4 6.68 2011 11.95 >1000 - | - 1974 2.3 -94.5 6.83 2681 11.18 68.4 - |

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WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-122 | PF-123 | PF-124 | PF-125 | PF-126 | PF-127 |
|---|---|--|--|---|--|--|---|
| | | PF-122-WG-01-051011 5/10/2011 13:00 11 - 15 L1106504-02 | PF-123-WG-01-051711 5/17/2011 14:35 11 - 15 L1106891-03 | PF-124-WG-01-042611 4/26/2011 12:45 8 - 12 L1105667-03 | PF-125-WG-01-042611 4/26/2011 10:15 11 - 15 L1105667-02 | PF-126-WG-01-051711 5/17/2011 10:00 6 - 10 L1106891-02 | PF-127-WG-01-050611 5/6/2011 13:45 8 - 12 L1106374-03 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 32.2 | 67.1 | 0.374 | 39 | 23.1 | 0.055U |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.071 0.062 | 0.025 0.023 | 0.011 0.009 | 0.017 0.017 | 0.166 0.109 | 0.003U 0.003U |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 3.2 0.5U | 0.5U 36 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.72 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - 602 0.52 -42.4 5.98 803 11.9 10.6 - | - 1988 0.62 -191 6.98 2702 11.12 61.4 - | - 373 0.31 -30.6 6.97 540 8.78 4.84 - | - 1458 0.4 -67.8 6.65 1016 9.12 16.3 - | - 1001 0.56 -104.7 6.95 1317 12.44 >1000 - | - 1484 0.59 50.7 6.89 1863 14.34 13.5 - |

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-128 | PF-129 | PF-130 | PF-130 |
|---|---|--|--|---|--|
| | | PF-128-WG-01-050611 5/6/2011 11:05 8 - 12 L1106374-01 | PF-129-WG-01-081911 8/19/2011 12:49 16 - 20 L1112895-02 | PF-130-WG-01-081711 8/17/2011 12:50 6 - 10 L1112674-04 | PF-130-WG-02-081711 8/17/2011 14:30 10 - 14 L1112674-05 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 0.075U | 0.488 | 13.3 | 18.5 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.012 0.003U | 0.01 0.003U | 0.026J 0.015J | 0.018J 0.011J |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 4 2U 0.4J | 0.5U 0.78 2U 0.5U | 0.5U 2.5 1.2J 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - 1082 5.6 83.6 7.07 1361 14.24 82.5 - | - 868 1.42 -25.8 5.96 897 23.3 124 - | - 2584 0.62 -68.7 6.8 2802 21 145 - | - 2387 1.15 -56.9 6.69 2458 23.49 64.3 - |

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-131 | | | PF-132 | | | |
|---|---|--|---|--|---|---|--|--|
| | | PF-131-WG-01-081811 8/18/2011 10:11 2 - 6 L1112764-02 | PF-131-WG-02-081811 8/18/2011 12:07 9 - 13 L1112764-03 | PF-131-WG-03-081811 8/18/2011 14:00 19 - 23 L1112764-04 | PF-132-WG-01-081611 8/16/2011 12:45 2 - 6 L1112550-02 | PF-132-WG-02-081611 8/16/2011 15:03 9 - 13 L1112550-03 | PF-132-WG-03-081711 8/17/2011 10:13 19 - 23 L1112674-02 | 0553-FD-001-081711 8/17/2011 0:00 19 - 23 L1112674-03 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 3.82 | 28.4 | 201 | 8.98 | 67 | 4.42 | 4.89 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.01 0.009 | 0.009 0.006 | 0.276 0.138 | 0.032 0.031 | 0.034 0.024 | 0.017 0.01 | 0.017 0.009 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 1U 180 4U 1U | 50U 7300 200U 50U | 5U 1200 20U 5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.49J 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS AMMONIUM (mg/L) CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) FERROUS IRON (mg/L) | 4 NA NA NA NA NA NA NA NA | - 627 1.1 28.9 5.67 672 21.44 8.36 - | - 1649 0.96 -150.2 6.35 1799 20.64 43.9 - | - 2491 0.76 -119.9 6.77 2745 20.17 >1000 - | - 1452 0.57 -106.3 6.72 1669 18.16 68.2 - | - 1048 0.52 -215.7 6.67 1199 18.4 168 - | - 1048 0.52 -215.7 6.67 1199 18.4 168 - | - 954 0.88 -36.2 6.78 1045 20.43 130 - |

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location | GROUNDWATER CLEANUP STANDARDS | MW-101 | | | MW-102 | | |
|------------------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Sample ID | | MW-101-WG-01-060211 | MW-101-WG-01-080811 | MW-101-WG-01-110211 | MW-102-WG-01-060211 | MW-102-WG-01-080811 | MW-102-WG-01-110211 |
| Sample Date | | 6/2/2011 10:40 | 8/8/2011 10:15 | 11/2/2011 11:00 | 6/2/2011 12:30 | 8/8/2011 11:40 | 11/2/2011 12:36 |
| Sample Depth (FT) | | 4 - 14 | 4 - 14 | 4 - 14 | 4 - 14 | 4 - 14 | 4 - 14 |
| Lab Sample ID | | L1107711-02 | L1112001-01 | L1118080-01 | L1107711-03 | L1112001-03 | L1118080-02 |
| | | | | | | | |
| NITROGEN SPECIES (mg/L) | | | | | | | |
| NITRATE (AS N) | NA | 0.11 | - | - | 0.36 | - | - |
| NITRITE (AS N) | NA | 0.04J | - | - | 0.03J | - | - |
| NITROGEN, AMMONIA | 4 | 13 | 8.07J | 15.3 | 11.9 | 9.54J | 8.28 |
| NITROGEN, ORGANIC | NA | 2 | - | - | 2.1 | - | - |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 15 | - | - | 14 | - | - |
| | | | | | | | |
| METALS (mg/L) | | | | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.015 | 0.014 | 0.016 | 0.042 | 0.045 | 0.034 |
| ARSENIC (DISSOLVED) | NA | 0.013 | 0.008 | 0.015 | 0.04 | 0.048 | 0.033 |
| | | | | | | | |
| VOCs (ug/L) | | | | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 1U | 0.5U | 0.5U | 1U | 0.5U |
| BENZENE | 4 | 0.83 | 1.4 | 0.5U | 23 | 0.41J | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 1U | 0.5U | 0.5U | 1U | 0.5U |
| | | | | | | | |
| OTHER | | | | | | | |
| TOTAL SUSPENDED SOLIDS (mg/L) | NA | 26 | - | - | 32 | - | - |
| TOTAL DISSOLVED SOLIDS (mg/L) | NA | 2000 | - | - | 1200 | - | - |
| TOTAL ORGANIC CARBON (mg/L) | NA | 32 | - | - | 18 | - | - |
| DISSOLVED ORGANIC CARBON (mg/L) | NA | 31 | - | - | 40 | - | - |
| | | | | | | | |
| FIELD PARAMETERS | | | | | | | |
| AMMONIA (mg/L) | 4 | 0.011 | - | - | 0.003 | - | - |
| AMMONIUM (mg/L) | 4 | 9.247 | - | - | 7.441 | - | - |
| CONDUCTIVITY (uS/cm) | NA | 1815 | 2237 | 1633 | 1333 | 1540 | 657 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.58 | 0.94 | 1.3 | 0.66 | 0.98 | 1.22 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -74.8 | -29.1 | -70 | -37.3 | 16.1 | -25.2 |
| pH | NA | 6.73 | 6.63 | 6.72 | 6.15 | 5.89 | 6.03 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 2398 | 2545 | 2157 | 1605 | 1586 | 821 |
| TEMPERATURE (C) | NA | 12.27 | 18.67 | 12.27 | 16.13 | 23.49 | 14.52 |
| TURBIDITY (NTU) | NA | 3.34 | 4.94 | 6.43 | 3.97 | 0.91 | 3.51 |

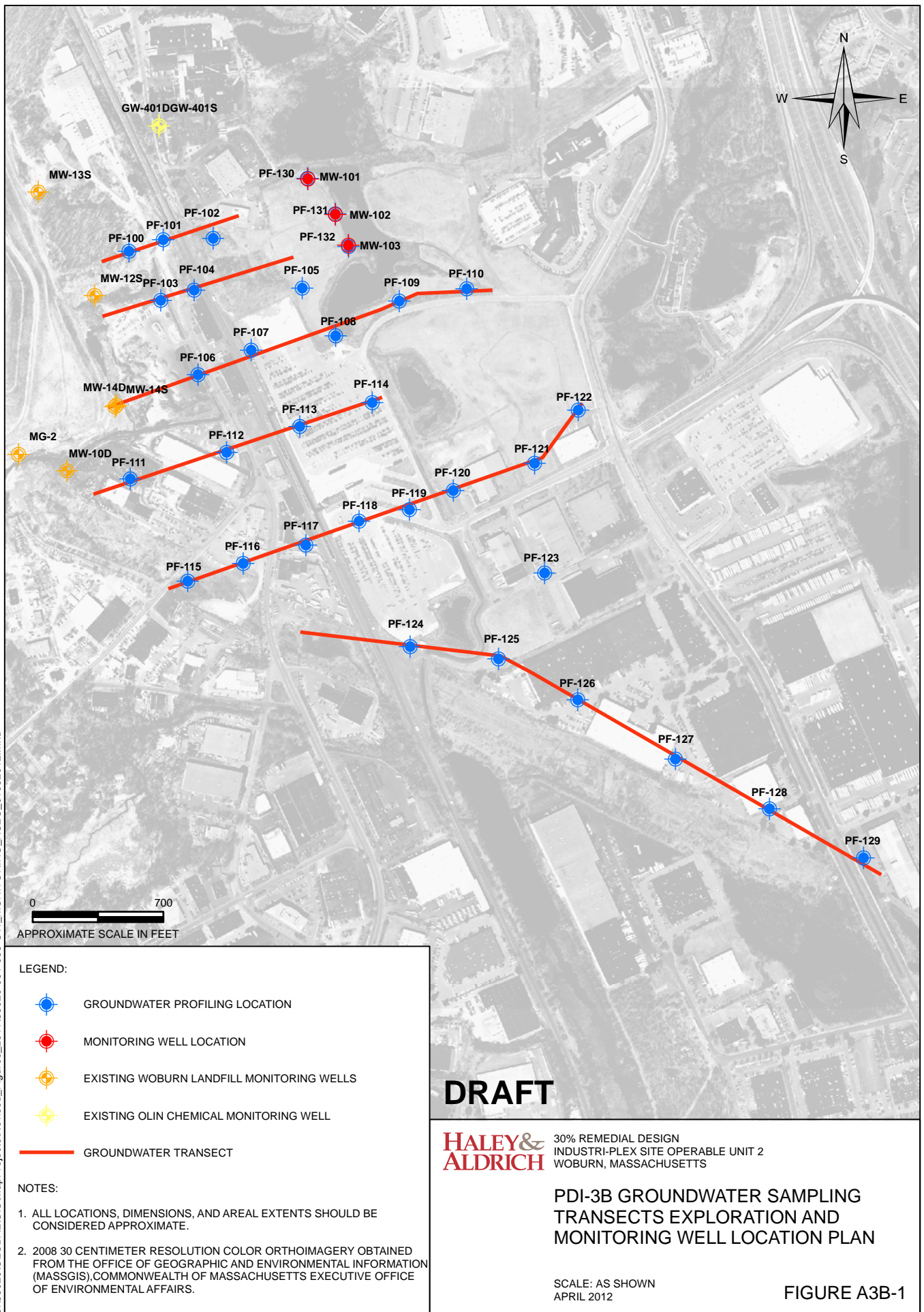
- NOTES:
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 - 2. "-" INDICATES DATA NOT COLLECTED
 - 3. PERFORMANCE STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

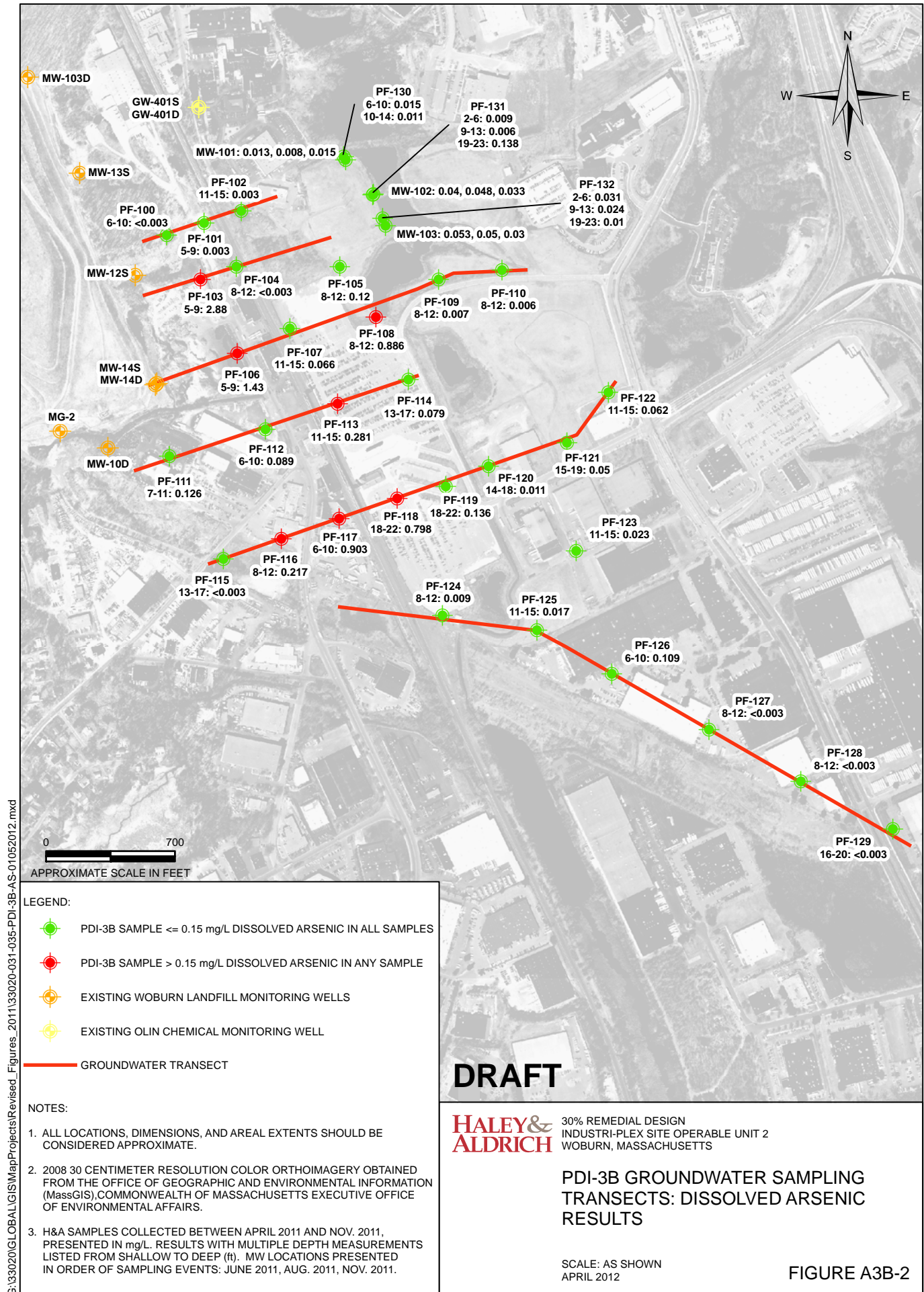
30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

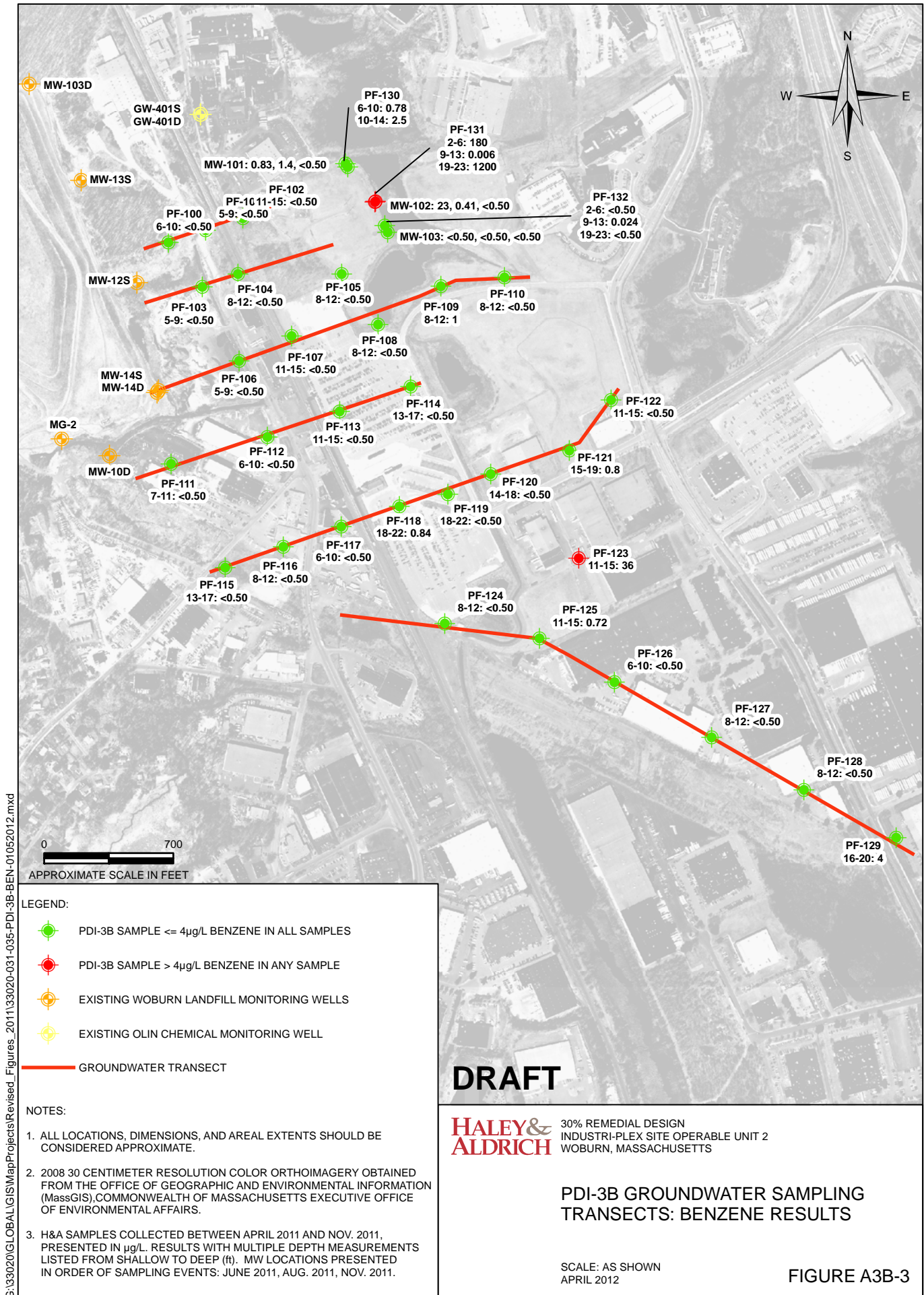
| Location | GROUNDWATER CLEANUP STANDARDS | MW-103 | | |
|------------------------------------|-------------------------------------|---------------------|---------------------|---------------------|
| Sample ID | | MW-103-WG-01-060211 | MW-103-WG-01-080811 | MW-103-WG-01-110211 |
| Sample Date | | 6/2/2011 14:15 | 8/8/2011 13:20 | 11/2/2011 14:10 |
| Sample Depth (FT) | | 4 - 14 | 4 - 14 | 4 - 14 |
| Lab Sample ID | | L1107711-04 | L1112001-04 | L1118080-03 |
| NITROGEN SPECIES (mg/L) | | | | |
| NITRATE (AS N) | NA | 0.1U | - | - |
| NITRITE (AS N) | NA | 0.05U | - | - |
| NITROGEN, AMMONIA | 4 | 35.6 | 51.2J | 18.7 |
| NITROGEN, ORGANIC | NA | 3.4 | - | - |
| TOTAL KJELDAHL NITROGEN (TKN) | NA | 39 | - | - |
| METALS (mg/L) | | | | |
| ARSENIC (TOTAL) | 0.15 | 0.05 | 0.047 | 0.031 |
| ARSENIC (DISSOLVED) | NA | 0.053 | 0.05 | 0.03 |
| VOCs (ug/L) | | | | |
| 1,2-DICHLOROETHANE | 2 | 0.5U | 1U | 0.5U |
| BENZENE | 4 | 0.5U | 0.5U | 0.5U |
| NAPHTHALENE | 5 | 2U | 2U | 2U |
| TRICHLOROETHENE | 1 | 0.5U | 1U | 0.5U |
| OTHER | | | | |
| TOTAL SUSPENDED SOLIDS (mg/L) | NA | 11 | - | - |
| TOTAL DISSOLVED SOLIDS (mg/L) | NA | 1100 | - | - |
| TOTAL ORGANIC CARBON (mg/L) | NA | 13 | - | - |
| DISSOLVED ORGANIC CARBON (mg/L) | NA | 15 | - | - |
| FIELD PARAMETERS | | | | |
| AMMONIA (mg/L) | 4 | 0.051 | - | - |
| AMMONIUM (mg/L) | 4 | 33.42 | - | - |
| CONDUCTIVITY (uS/cm) | NA | 1377 | 1526 | 1287 |
| DISSOLVED OXYGEN (mg/L) | NA | 0.58 | 0.68 | 1.07 |
| OXIDATION REDUCTION POTENTIAL (mV) | NA | -78 | -60.4 | -70.2 |
| pH | NA | 6.75 | 6.6 | 6.7 |
| SPECIFIC CONDUCTANCE (uS/cm) | NA | 1726 | 1633 | 1594 |
| TEMPERATURE (C) | NA | 14.42 | 21.59 | 14.93 |
| TURBIDITY (NTU) | NA | 1.61 | 2.89 | 0.52 |

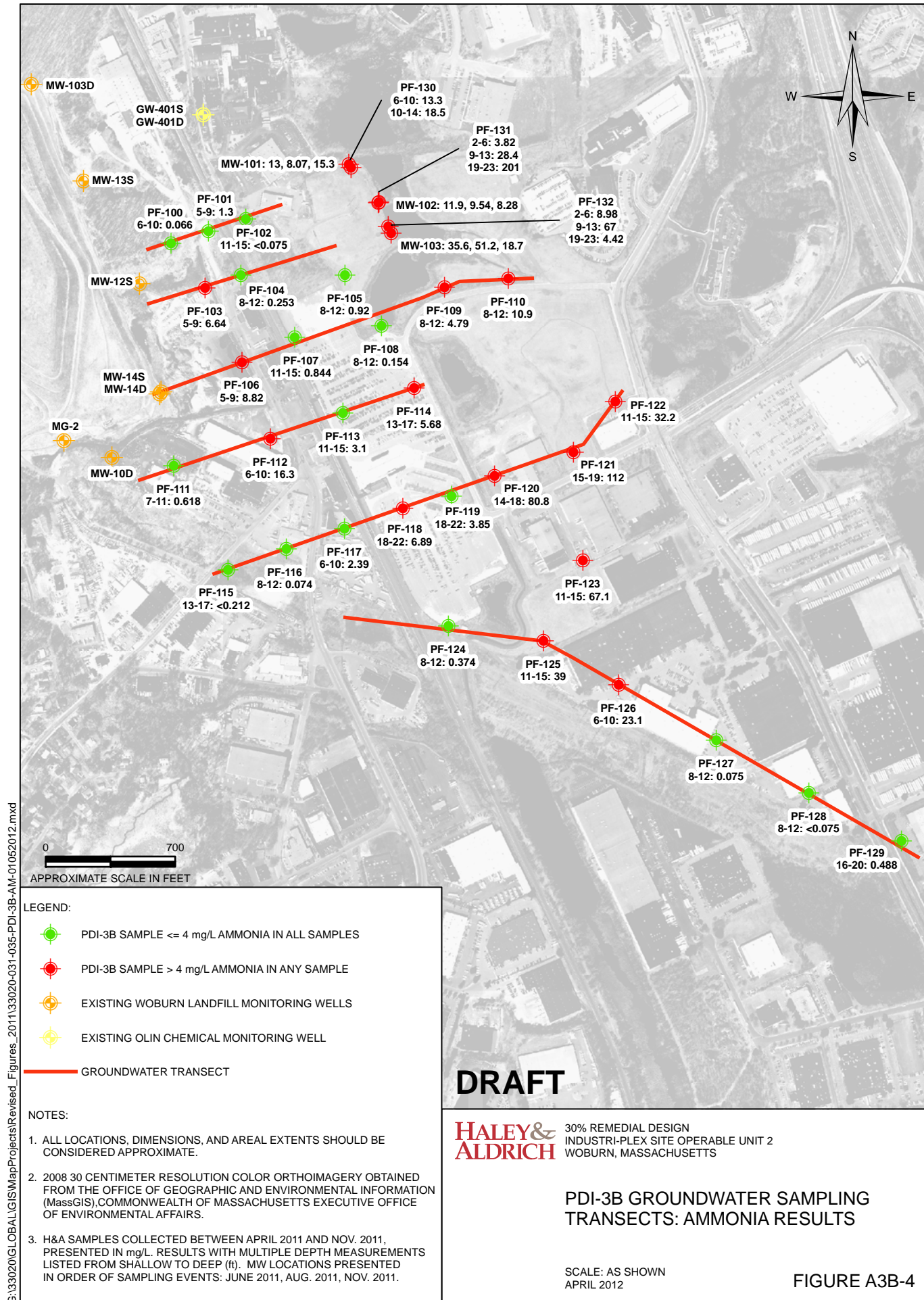
- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. "-" INDICATES DATA NOT COLLECTED
 - 3. PERFORMANCE STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

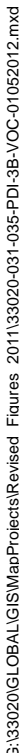
G:\33020\GLOBAL\GIS\MapProjects\Revised_Figures_2011\33020-031-035-GW_MONITORING_XSEC_01052012.mxd











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ATTACHMENT A12

PDI- 12 Institutional Controls

1. OBJECTIVE AND SCOPE

PDI-12A - Soil Institutional Controls

The objective of PDI-12A was to identify properties or portions of properties within the boundary of Former Lake Mishawum (FLM) that have arsenic concentrations in surface and/or subsurface soils that are greater than the cleanup standard of 50 mg/kg and to fill any Remedial Investigation (RI) data gaps.

ICs will be established for these properties to restrict contact with soil and to ensure the long-term effectiveness and protectiveness of response actions performed at the Site.

PDI-12B - Groundwater Institutional Controls

The objective of PDI-12B was to identify properties at which groundwater had concentrations of constituents that were above the cleanup standards listed below:

| Compound | Cleanup Standard (µg/L) |
|--------------------|-------------------------|
| Arsenic | 150 |
| Benzene | 4 |
| Ammonia | 4,000 |
| 1,2-Dichloroethane | 2 |
| Trichloroethene | 1 |
| Naphthalene | 5 |

These properties will require ICs to restrict contact with drinking water, industrial process water, commercial-use water (such as car wash facilities) and groundwater. To evaluate which properties will require ICs, PDI-12B relies on data collected historically and during recent PDIs:

- PDI-3 - Groundwater Investigation
- PDI-9 - West Hide Pile Investigations and Assessment
- PDI-10 - Impermeable Caps
- PDI-14 - Ammonia Background Investigation

ICs will rely on historical data and data collected during pre-design investigations (PDIs) conducted as part of the remedial design.

2. IMPLEMENTATION SUMMARY

PDI-12A - Soil Institutional Controls

Soil samples were collected in accordance with the FSP as described below:

- The drilling contractor advanced 44 soil borings to a depth of approximately 15 feet (ft) below ground surface (bgs) using a Geoprobe® 6610DT rubber-track mounted direct push rig. Explorations were advanced in 5 ft intervals using 5 ft long, 1 7/8 in. I.D. Geoprobe® liners.
- Each boring was terminated when the peat/organic deposits were encountered, as these deposits likely define the bottom of the FLM. It was anticipated that these deposits would be encountered within 15 ft of the ground surface. Several explorations were advanced deeper than 15 ft bgs to locate the depth of the top of FLM sediment bed, but analytical samples were not collected beyond the 15 ft depth.

- Explorations were logged and soil samples were collected from the liners and composited from 0-3 ft and 3-15 ft depth intervals.
- A total of 143 soil samples were collected as part of PDI-12A including 98 from shallow soils (i.e., 0-3 ft bgs) and 45 from subsurface soils (i.e., 3-15 ft bgs).
- Excess soil cuttings not used for analytical soil samples were containerized and transported to the storage drum containment, located adjacent to the Groundwater Treatment Building (GWTB).
- Upon completion, explorations were tremie-grouted with bentonite to ground surface, and the ground surface was restored as appropriate (e.g., cold patch asphalt was placed in paved areas).
 - One soil sampling location (SO-124) was eliminated from the sampling program due to the presence of numerous utilities in the area, and the proximity of other nearby PDI-12A sampling locations.
 - Following sampling, the completed locations were captured with GPS. Subsequently, all soil sampling locations were surveyed by a professional land surveyor.

Results of the initial soil sampling conducted at 10 Commerce Way and 20 & 30 Commerce Way properties indicated that arsenic exceeded the soil cleanup standard; therefore several additional sampling locations were added to the PDI-12A sampling program to better delineate the extent of arsenic impact in soil. Sampling procedures conducted for these additional samples were consistent with those described above with exception of sample location SO-144, in which the 0-3 ft sample was collected using a stainless steel hand auger. The 0-3 ft soil sample was collected from the side of the SO-144 exploration. A 3-15 ft depth soil sample was not collected at SO-144. Following sampling, the exploration was backfilled with the excavated soils. Samples collected during PDI-12A were submitted to Alpha Analytical, Inc., Westborough, Massachusetts for the analysis of total arsenic by EPA Method 6010.

PDI-12B - Groundwater Institutional Controls

As part of PDI-12B, groundwater profiling samples were collected at eight locations, four of which were predetermined under the FSP. Four new locations were chosen where arsenic concentrations in soil measured during PDI-12A were greater than 50 mg/Kg.

To conduct the groundwater profiling:

- The drilling contractor used a Geoprobe® 6610 DT rubber-track mounted rig to advance a stainless steel sampling point consisting of a 4 ft long stainless steel sample rod protected by a stainless steel sleeve. At the appropriate sampling depth, the sleeve was retracted to expose a 4 ft length of stainless steel screen from which groundwater samples were collected. At locations where water table depth could not be confirmed (by previous explorations, existing monitoring wells, or from nearby surface water features), 1 7/8 in. ID Geoprobe® soil sampling sleeves were advanced to confirm the depth of groundwater, prior to the advancement of the initial sampling point.
- In general, samples were collected at three depth intervals starting at the approximate depth of the water table, which varied between 4 and 17 ft. The subsequent two depth intervals were each generally an additional 10 ft deep.

- After the sampling point was advanced to the appropriate depth and the screen exposed, either ¼ in. or ⅜ in. ID HDPE tubing was inserted into the drill string and installed so that the bottom of tubing was located approximately in the center of the screened interval.
- Groundwater sampling was conducted in accordance with Haley & Aldrich operating procedure OP3012, “Low Stress/Low Flow Groundwater Sample Collection Procedure”, by purging the screened profiling interval with a peristaltic pump and utilizing low-flow techniques to determine parameter stabilization prior to sampling.
- Field parameters were collected using a YSI Model 6920 V2-2 multi-parameter sonde or equivalent, installed in a flow-through cell. Parameters including dissolved oxygen, temperature, specific conductivity, pH, oxidation reduction potential and turbidity were continuously monitored until they had stabilized in accordance with OP3012. Turbidity was monitored using a HACH Model 2100p turbidimeter.
- VOCs were collected first, at a pumping rate that did not exceed 100 mL/min. Samples were collected with no headspace in a 40 mL glass vial with a Teflon cap.
- Following collection of VOCs, an unfiltered sample was collected for ammonia analysis. Filtered and unfiltered samples were collected for arsenic analysis; filtered samples were passed through an in-line 0.45-micron filter.
- At sampling locations where turbidity readings did not reach the target level of <5 NTU, groundwater samples were collected when all other parameters had reached stabilization criteria and turbidity readings stabilized within 10% for three consecutive readings. Deviations from stabilization criteria were documented on the groundwater sampling records.
- Upon completion of groundwater sampling, tooling and sampling equipment were removed from the borehole and explorations were tremie-grouted with bentonite grout to ground surface. Groundsurface was restored as appropriate (e.g., cold patch asphalt was placed in paved areas).by the drilling contractor.
- Locations were captured with GPS and subsequently surveyed by the surveying contractor.

Groundwater samples collected during PDI-12B were submitted to Alpha Analytical, Inc., Westborough, Massachusetts for the analysis of benzene, 1,2-dichloroethane, trichloroethene, and naphthalene by EPA Method 8260, ammonia by Method SM 4500, and arsenic by EPA Method 6010.

3. RESULTS

PDI-12A - Soil Institutional Controls

The soil boring locations and a comparison of the analytical results to the cleanup standard for surface soils and subsurface soils are shown on Figure A12A-1. Analytical results are summarized in Table A12A-I.

Arsenic was detected above the cleanup standard of 50 mg/Kg in forty-seven of the ninety eight surface (0-3 ft bgs) soil samples analyzed. Arsenic exceeded the cleanup standard in only four of the forty-five subsurface (3-15 ft bgs) soil samples.

PDI-12B - Groundwater Institutional Controls

The groundwater profiling locations are shown on Figure A12B-1; analytical results are summarized in Table A12B-I. Further details on the results of PDI-12, including a discussion of those properties requiring IC, are provided in the 30% Design Report.

Based on the PARCCs and data validation reviews, the data collected during PDI-12A and PDI-12B were deemed to have met or exceeded the minimum standard requirements for field and analytical methods. Details of the PARCCS review and a summary of data validation are provided in Exhibit A12-1. Data quality objectives (DQOs) for PDI-12A and PDI-12B have been attained.

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| LOCATION | FIELD SAMPLE ID | SAMPLE DATE | DEPTH (FT) | LAB SAMPLE ID | Arsenic, Total (mg/kg) |
|----------|---------------------|-------------|-------------|---------------|------------------------|
| SO-101 | SO-101-SO-01-051711 | 5/17/2011 | 0 - 3 | L1106892-01 | 7.7 |
| SO-101 | SO-101-SO-02-051711 | 5/17/2011 | 3 - 15 | L1106892-02 | 7.5 |
| SO-102 | SO-102-SO-01-051811 | 5/18/2011 | 0 - 3 | L1106959-01 | 62J |
| SO-102 | SO-102-SO-02-051811 | 5/18/2011 | 3 - 15 | L1106959-02 | 6.1J |
| SO-103 | SO-103-SO-01-041711 | 4/17/2011 | 0 - 3 | L1105208-03 | 25 |
| SO-103 | SO-103-SO-02-041711 | 4/17/2011 | 3 - 15 | L1105208-04 | 16 |
| SO-104 | SO-104-SO-01-041711 | 4/17/2011 | 0 - 3 | L1105208-01 | 7.6 |
| SO-104 | SO-104-SO-02-041711 | 4/17/2011 | 3 - 10.5 | L1105208-02 | 10 |
| SO-104 | SO-104-SO-03-041711 | 4/17/2011 | 10.5 - 16.5 | L1106109-13 | 30 |
| SO-105 | SO-105-SO-01-041711 | 4/17/2011 | 0 - 3 | L1105208-05 | 8.6 |
| SO-105 | SO-105-SO-02-041711 | 4/17/2011 | 3 - 15 | L1105208-06 | 8.5 |
| SO-106 | SO-106-SO-01-051811 | 5/18/2011 | 0 - 3 | L1106959-03 | 13J |
| SO-106 | SO-106-SO-02-051811 | 5/18/2011 | 3 - 15 | L1106959-04 | 15J |
| SO-107 | SO-107-SO-01-042911 | 4/29/2011 | 0 - 3 | L1105910-03 | 6.5 |
| SO-107 | SO-107-SO-02-042911 | 4/29/2011 | 3 - 15 | L1105910-04 | 5.4 |
| SO-108 | SO-108-SO-01-043011 | 4/30/2011 | 0 - 3 | L1106031-01 | 15 |
| SO-108 | SO-108-SO-02-043011 | 4/30/2011 | 3 - 14 | L1106031-02 | 8.9 |
| SO-108 | SO-108-SO-03-043011 | 4/30/2011 | 14 - 15 | L1106031-08 | 4.9 |
| SO-109 | SO-109-SO-01-042911 | 4/29/2011 | 0 - 3 | L1105910-01 | 11 |
| SO-109 | SO-109-SO-02-042911 | 4/29/2011 | 3 - 14 | L1105910-02 | 12 |
| SO-109 | SO-109-SO-03-042911 | 4/29/2011 | 14 - 15 | L1106109-14 | 15 |
| SO-110 | SO-110-SO-01-042711 | 4/27/2011 | 0 - 3 | L1105750-07 | 9.8 |
| SO-110 | SO-110-SO-02-042711 | 4/27/2011 | 3 - 15 | L1105750-08 | 8 |
| SO-111 | SO-111-SO-01-041711 | 4/17/2011 | 0 - 3 | L1105208-07 | 22 |
| SO-111 | SO-111-SO-02-041711 | 4/17/2011 | 3 - 7 | L1105208-08 | 16 |
| SO-111 | SO-111-SO-03-043011 | 4/30/2011 | 7 - 15 | L1106031-09 | 2.5 |
| SO-112 | SO-112-SO-01-050311 | 5/3/2011 | 0 - 3 | L1106109-10 | 14 |
| SO-112 | SO-112-SO-02-050311 | 5/3/2011 | 3 - 15 | L1106109-11 | 4.5 |
| SO-113 | SO-113-SO-01-050311 | 5/3/2011 | 0 - 3 | L1106109-06 | 5 |
| SO-113 | SO-113-SO-02-050311 | 5/3/2011 | 3 - 15 | L1106109-07 | 2.1 |
| SO-114 | SO-114-SO-01-043011 | 4/30/2011 | 0 - 3 | L1106031-05 | 26 |
| SO-114 | SO-114-SO-02-043011 | 4/30/2011 | 3 - 15 | L1106031-06 | 4.8 |
| SO-115 | SO-115-SO-01-042711 | 4/27/2011 | 0 - 3 | L1105750-03 | 16 |
| SO-115 | SO-115-SO-02-042711 | 4/27/2011 | 3 - 15 | L1105750-04 | 10 |
| SO-116 | SO-116-SO-01-050411 | 5/4/2011 | 0 - 3 | L1106169-01 | 12 |
| SO-116 | SO-116-SO-02-050411 | 5/4/2011 | 3 - 15 | L1106169-02 | 20 |
| SO-116 | 0553-FD-001-050411 | 5/4/2011 | 3 - 15 | L1106169-03 | 14 |
| SO-117 | SO-117-SO-01-042711 | 4/27/2011 | 0 - 3 | L1105750-05 | 20 |
| SO-117 | SO-117-SO-02-042711 | 4/27/2011 | 3 - 15 | L1105750-06 | 3.7 |
| SO-118 | SO-118-SO-01-043011 | 4/30/2011 | 0 - 3 | L1106031-03 | 13 |
| SO-118 | SO-118-SO-02-043011 | 4/30/2011 | 3 - 15 | L1106031-04 | 20 |
| SO-119 | SO-119-SO-01-050311 | 5/3/2011 | 0 - 3 | L1106109-08 | 8.9 |
| SO-119 | SO-119-SO-02-050311 | 5/3/2011 | 3 - 15 | L1106109-09 | 10 |
| SO-120 | SO-120-SO-01-050411 | 5/4/2011 | 0 - 3 | L1106169-06 | 2.7 |
| SO-120 | SO-120-SO-02-050411 | 5/4/2011 | 3 - 15 | L1106169-07 | 24 |
| SO-121 | SO-121-SO-01-042711 | 4/27/2011 | 0 - 3 | L1105750-01 | 8.8 |
| SO-121 | SO-121-SO-02-042711 | 4/27/2011 | 3 - 15 | L1105750-02 | 9.8 |
| SO-122 | SO-122-SO-01-050411 | 5/4/2011 | 0 - 3 | L1106169-04 | 8 |
| SO-122 | SO-122-SO-02-050411 | 5/4/2011 | 3 - 15 | L1106169-05 | 8 |
| SO-123 | SO-123-SO-01-052411 | 5/24/2011 | 0 - 3 | L1107258-08 | 10 |
| SO-123 | SO-123-SO-02-052411 | 5/24/2011 | 3 - 15 | L1107258-09 | 31 |
| SO-125 | SO-125-SO-01-052411 | 5/24/2011 | 0 - 3 | L1107258-10 | 8.8 |
| SO-125 | SO-125-SO-02-052411 | 5/24/2011 | 3 - 15 | L1107258-11 | 5.4 |
| SO-126 | SO-126-SO-01-050211 | 5/2/2011 | 0 - 3 | L1106032-03 | 240J |
| SO-126 | SO-126-SO-02-050211 | 5/2/2011 | 3 - 15 | L1106032-04 | 240J |
| SO-127 | SO-127-SO-01-052411 | 5/24/2011 | 0 - 3 | L1107258-06 | 520 |
| SO-127 | SO-127-SO-02-052411 | 5/24/2011 | 3 - 15 | L1107258-07 | 1.3 |
| SO-128 | SO-128-SO-01-050211 | 5/2/2011 | 0 - 3 | L1106032-05 | 110J |
| SO-128 | SO-128-SO-02-050211 | 5/2/2011 | 3 - 15 | L1106032-06 | 4.6J |
| SO-129 | SO-129-SO-01-050211 | 5/2/2011 | 0 - 3 | L1106032-01 | 130J |
| SO-129 | SO-129-SO-02-050211 | 5/2/2011 | 3 - 15 | L1106032-02 | 300J |
| SO-130 | SO-130-SO-01-052411 | 5/24/2011 | 0 - 3 | L1107258-01 | 2.5 |
| SO-130 | SO-130-SO-02-052411 | 5/24/2011 | 3 - 15 | L1107258-02 | 1.6 |
| SO-130 | 0553-FD-001-052411 | 5/24/2011 | 3 - 15 | L1107258-03 | 1.5 |
| SO-131 | SO-131-SO-01-052411 | 5/24/2011 | 0 - 3 | L1107258-04 | 7.5 |
| SO-131 | SO-131-SO-02-052411 | 5/24/2011 | 3 - 15 | L1107258-05 | 7.3 |
| SO-132 | SO-132-SO-01-050211 | 5/2/2011 | 0 - 3 | L1106032-07 | 16J |
| SO-132 | SO-132-SO-02-050211 | 5/2/2011 | 3 - 6 | L1106032-08 | 56J |
| SO-132 | SO-132-SO-03-050211 | 5/2/2011 | 6 - 15 | L1106032-09 | 210J |
| SO-133 | SO-133-SO-01-050311 | 5/3/2011 | 0 - 3 | L1106109-04 | 13 |
| SO-133 | SO-133-SO-02-050311 | 5/3/2011 | 3 - 15 | L1106109-05 | 6.2 |
| SO-134 | SO-134-SO-01-050311 | 5/3/2011 | 0 - 3 | L1106109-01 | 70 |
| SO-134 | 0553-FD-001-050311 | 5/3/2011 | 0 - 3 | L1106109-02 | 76 |
| SO-134 | SO-134-SO-02-050311 | 5/3/2011 | 3 - 15 | L1106109-03 | 9.6 |
| SO-136 | SO-136-SO-01-051611 | 5/16/2011 | 0 - 3 | L1106834-01 | 11 |
| SO-136 | SO-136-SO-02-051611 | 5/16/2011 | 3 - 15 | L1106834-02 | 5.1 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. ARSENIC, TOTAL CLEANUP STANDARD: 50 mg/kg
 - 3. CLEANUP STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE



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| LOCATION | FIELD SAMPLE ID | SAMPLE DATE | DEPTH (FT) | LAB SAMPLE ID | Arsenic, Total (mg/kg) |
|----------|---------------------|-------------|------------|---------------|------------------------|
| SO-140 | SO-140-SO-01-081911 | 8/19/2011 | 0 - 3 | L1112900-01 | 57 |
| SO-140 | SO-140-SO-02-081911 | 8/19/2011 | 3 - 15 | L1112900-02 | 8.6 |
| SO-141 | SO-141-SO-01-081911 | 8/19/2011 | 0 - 3 | L1112900-03 | 13 |
| SO-141 | SO-141-SO-02-081911 | 8/19/2011 | 3 - 15 | L1112900-04 | 5 |
| SO-142 | SO-142-SO-01-081611 | 8/16/2011 | 0 - 3 | L1112581-01 | 5.6 |
| SO-142 | SO-142-SO-02-081611 | 8/16/2011 | 3 - 15 | L1112581-02 | 8.5 |
| SO-142 | 0553-FD-001-081611 | 8/16/2011 | 3 - 15 | L1112581-03 | 13 |
| SO-143 | SO-143-SO-01-081611 | 8/16/2011 | 0 - 3 | L1112581-04 | 1.4 |
| SO-143 | SO-143-SO-02-081611 | 8/16/2011 | 3 - 15 | L1112581-05 | 2.2 |
| SO-144 | SO-144-SO-01-091911 | 9/19/2011 | 0 - 3 | L1114818-01 | 26 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. ARSENIC, TOTAL CLEANUP STANDARD: 50 mg/kg
 - 3. CLEANUP STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE

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WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-201 | | | | PF-202 | |
|---|--------------------------------------|--|---|---|---|--|--|
| | | PF-201-WG-01-050511 5/5/2011 10:20 6 - 10 L1106273-02 | PF-201-WG-02-050511 5/5/2011 12:15 16 - 20 L1106273-03 | 0553-FD-001-050511 5/5/2011 0:00 16 - 20 L1106273-04 | PF-201-WG-03-050511 5/5/2011 14:30 26 - 30 L1106273-05 | PF-202-WG-01-051911 5/19/2011 12:30 21 - 25 L1107050-02 | PF-202-WG-02-051911 5/19/2011 14:35 31 - 35 L1107050-03 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 1.22 | 0.076U | 0.05U | 0.056U | 2.54 | 1.28 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.014 0.002J | 0.007 0.003U | 0.012 0.003U | 0.007 0.003U | 0.002J 0.003 | 0.037 0.003 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 3.5 0.5U | 0.5U 0.5U 36 0.5U |
| FIELD PARAMETERS CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) | NA NA NA NA NA NA | 3412 1.09 -4.8 6.51 4731 10.4 546 | 875 0.45 70.1 6.27 1168 11.84 436 | 3412 1.09 -4.8 6.51 4731 10.4 546 | 661 0.48 91.7 6.08 885 11.79 92.4 | 697 0.53 -21.6 6.22 922 12.23 13.8 | 515 0.05 -422.6 6.78 656 13.74 >1000 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. "-" INDICATES DATA NOT COLLECTED
 - 3. PERFORMANCE STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

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INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | PF-203 | | | | PF-204 | |
|---|--------------------------------------|--|--|--|--|--|--|
| | | PF-203-WG-01-081211 8/12/2011 10:05 4 - 8 L1112378-02 | PF-203-WG-02-081211 8/12/2011 12:00 14 - 18 L1112378-03 | 2287-FD-001-081211 8/12/2011 0:00 14 - 18 L1112378-05 | PF-203-WG-03-081211 8/12/2011 13:58 24 - 28 L1112378-04 | PF-204-WG-01-042811 4/28/2011 9:40 6 - 10 L1105853-02 | PF-204-WG-02-042811 4/28/2011 11:45 16 - 20 L1105853-03 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 1.41 | 1.31 | 1.14 | 0.107 | 0.102U | 0.727 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.017 0.009 | 0.004 0.005 | 0.004 0.004 | 0.006 0.003U | 0.009 0.003U | 0.013 0.003 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) | NA NA NA NA NA NA | 512 1.33 -87 6.27 560 20.49 413 | 624 0.73 -88 6.62 706 18.89 42.7 | 624 0.73 -88 6.62 706 18.89 42.7 | 756 0.4 -207.2 6.56 835 19.99 453 | 794 - 80.7 6.52 1098 10.51 406 | 791 - -43.2 6.77 1021 13.2 342 |

- NOTES:
- 1. VALIDATED DATA PRESENTED
 - 2. "-" INDICATES DATA NOT COLLECTED
 - 3. PERFORMANCE STANDARD EXCEEDANCES ARE **BOLD**
 - 4. J QUALIFIER INDICATES ESTIMATED VALUE
 - 5. U QUALIFER INDICATES A NON-DETECT, NUMBER SHOWN INDICATES THE REPORTING LIMIT

30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | SO-102 | | | | SO-126 | |
|---|--------------------------------------|--|--|--|--|--|--|
| | | PF-204-WG-03-042811 4/28/2011 13:45 26 - 30 L1105853-04 | SO-102-WG-01-081111 8/11/2011 11:40 13 - 17 L1112280-01 | SO-102-WG-02-081111 8/11/2011 13:10 23 - 27 L1112280-02 | SO-102-WG-03-081111 8/11/2011 14:50 33 - 37 L1112280-03 | SO-126-WG-01-052511 5/25/2011 9:55 7 - 11 L1107339-02 | SO-126-WG-02-052511 5/25/2011 12:00 17 - 21 L1107339-03 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 0.574 | 0.303 | 7.17 | 1210 | 4.31 | 6.47 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.008 0.003U | 0.004 0.002J | 0.258 0.263 | 0.841 0.44 | 0.075 0.069 | 3.75 3.87 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.28J 2U 0.5U | 0.5UJ 48J 10J 0.5UJ | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) | NA NA NA NA NA NA | 685 - -19.8 6.64 891 12.91 98.6 | 112 1.38 87.7 4.82 128 18.12 3.56 | 240 0.47 -53.8 6.62 272 18.74 40.1 | 9375 0.07 -193 7.74 9405 24.8 >1000 | 1095 1.05 -108.4 6.21 1383 14.08 4.62 | 1118 1.34 -154.1 6.88 1340 16.35 56.1 |

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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | |
|---|--------------------------------------|--|
| | | SO-126-WG-03-052511 5/25/2011 14:05 27 - 31 L1107339-04 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 1.53 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.067 0.02 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U |
| FIELD PARAMETERS CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) | NA NA NA NA NA NA | 878 1.76 -45.8 6.64 987 16.57 >1000 |

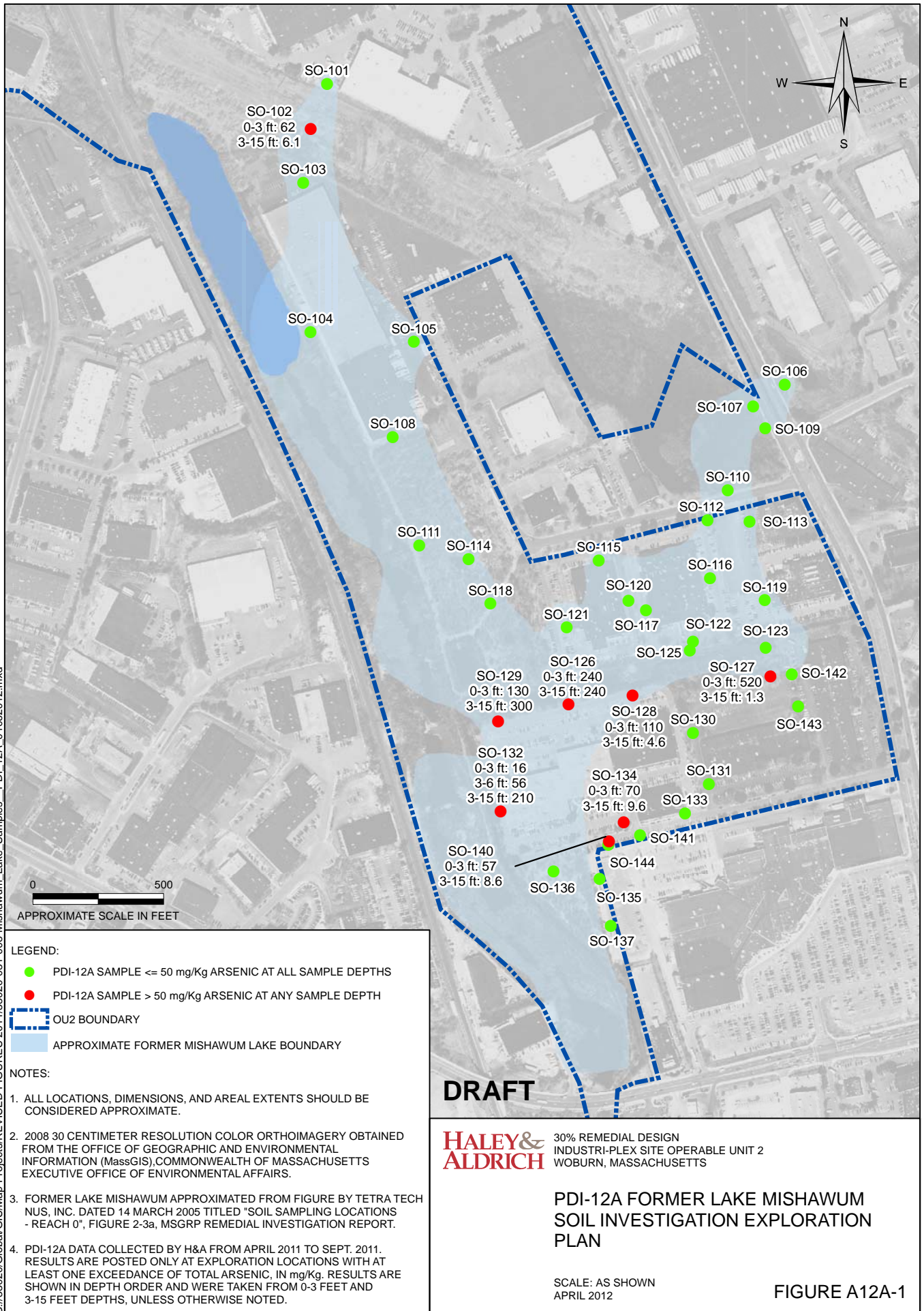
- NOTES:
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30% REMEDIAL DESIGN
INDUSTRI-PLEX SITE OPERABLE UNIT 2
WOBURN, MASSACHUSETTS

| Location Sample ID Sample Date Sample Depth (FT) Lab Sample ID | GROUNDWATER CLEANUP STANDARDS | SO-127 | | | SO-132 | | |
|---|--------------------------------------|---|--|--|---|--|---|
| | | SO-127-WG-01-081511 8/15/2011 10:00 6 - 10 L1112484-02 | SO-127-WG-02-081511 8/15/2011 12:00 16 - 20 L1112484-03 | SO-127-WG-03-081511 8/15/2011 14:00 26 - 30 L1112484-04 | SO-132-WG-01-052611 5/26/2011 9:47 0 - 3 L1107442-02 | SO-132-WG-02-052611 5/26/2011 12:10 3 - 6 L1107442-03 | SO-132-WG-03-052611 5/26/2011 14:00 6 - 15 L1107442-04 |
| NITROGEN SPECIES (mg/L) NITROGEN, AMMONIA | 4 | 2.77 | 0.233 | 0.16 | 6.42 | 3.74 | 3.57 |
| METALS (mg/L) ARSENIC (TOTAL) ARSENIC (DISSOLVED) | 0.15 NA | 0.017 0.01 | 0.12 0.003U | 0.042 0.003U | 0.096 0.081 | 0.416 0.309 | 0.322 0.123 |
| VOCs (ug/L) 1,2-DICHLOROETHANE BENZENE NAPHTHALENE TRICHLOROETHENE | 2 4 5 1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 1.1 | 0.5U 0.5U 2U 0.5U | 0.5U 0.5U 2U 0.57 | 0.5U 0.5U 2U 5.9 |
| FIELD PARAMETERS CONDUCTIVITY (uS/cm) DISSOLVED OXYGEN (mg/L) OXIDATION REDUCTION POTENTIAL (mV) pH SPECIFIC CONDUCTANCE (uS/cm) TEMPERATURE (C) TURBIDITY (NTU) | NA NA NA NA NA NA | 685 0.54 1.6 6.1 787 18.25 34.4 | 713 0.54 11.7 6.21 821 18.14 >1000 | 837 0.47 -49.2 6.37 938 17.04 690 | 3675 3.81 -63.6 6.22 4540 15.03 6.05 | 1166 2.71 -77.4 6.5 1417 15.72 554 | 1.25 2.3 -58 6.31 1253 15.49 >1000 |

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